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ABSTRACT

This monograph presents a collection of separate papers that focuses on pioneering projects in computer-mediated communication (CMC) and distance education. The first section of the monograph contains two papers describing the author's experiences with CMC projects that formed the foundation for his further CMC work: "NKI Electronic College," a distance education program using computer conferencing at NKI College in Oslo (Norway); and "Teaching Across the Atlantic," a computer-conference-based course conducted by experts form both sides of the Atlantic. In the second section, two papers--"Innovative Computer-Conferencing Courses" and "Computer-Mediated Communication and Distance Education around the World, An Annotated Bibliography"--provide 16 examples of the CMC projects in 12 countries the author has encountered through literature reviews and personal communications. Three articles that compile experiences, conclusions, and predictions for the future based on the author's perceptions and theories are presented in the final section: "GO MEEC," which describes a goal-oriented method for establishment of an electronic college; "The Electronic University," which predicts the development of future electronic universities; and "The Hexagon of Cooperative Freedom," which proposes a distance education theory attuned to CMC. Most of the papers include references; a total of 79 references are contained overall. (KRN)

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From Bulletin Boards to Electronic Universities

Distance Education, Computer-Mediated Communication, and Online Education

Morten Flate Paulsen

Number 7 in the series **Research Monographs**

The American Center for the Study of Distance Education
The Pennsylvania State University

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FOREWORD

The design and delivery of new learning environments based on computer conferencing have been characterized by tremendous growth and innovation in the last decade. Computer conferencing was first used for education in 1981; today, this medium has been adopted at all levels of education, from primary school to college, university, and adult training. Applications range from enhancing existing curricula and course delivery to supporting virtual classes and electronic universities and training programs.

Educational computer-mediated communication (CMC) has emerged as a new field. Online education is an umbrella term encompassing primary or secondary school applications, referred to as Learning Networks or Networked Classrooms, and university, college, or adult training applications, often designated Virtual Classrooms, Electronic Classrooms, or Electronic Universities. Although the terms vary, new communication media such as computer conferencing and networking have received positive acclaim from teachers and learners.

Computer conferencing has introduced important enhancements of and new options for teaching and learning. If the first decade confirmed that educational CMC was possible and worth doing, the next decade must meet the challenge of learning how to do it well. Our next focus must be on understanding this new field and improving the design of instructional events online. Educators must ask: How can we make a conference into a classroom? How can a conferencing system support group learning and become an environment for the various kinds of learning activities that comprise a university course, or an entire undergraduate or graduate degree program?

Experience indicates that successful implementation of CMC depends on attention to two activities:

- Conceptualizing education online and
- Designing educational activity online.

Conceptualizing Online Education: Opportunities and Constraints

Teaching online requires understanding the medium; such understanding is a necessary prerequisite to conceptualizing and designing the educational environments. In earlier works I have argued that online education is a new and unique domain: while it is similar in important ways to face-to-face education and also to other forms of distance education, computer conferencing has attributes that combine to offer both unprecedented opportunities and unfamiliar constraints for teaching and learning. The characteristics of computer conferencing shape the way in which educational tasks, timelines, and group processes can be implemented. Educators need to formulate the instructional events based on the attributes of computer conferencing, to shape this new medium into an appropriate and comfortable educational environment.

Five attributes of computer conferencing distinguish this communication system and provide a conceptual framework to guide teaching online. Computer conferencing is

- a medium for many-to-many communication,
- place-independent,
- asynchronous,
- text-based, and
- computer mediated.

These attributes combine to provide unique teaching and learning options; they also introduce unique challenges for designing and managing the online educational environment.

Designing Online Education

Education is based on intervention by a content and/or process expert (the instructor) who organizes the content and sequencing of the instructional activities. The instructional design of online environments is

one of the most critical factors in successful online education. Conceptual models based on collaborative learning, together with experiences from the field, provide valuable guidance for educators designing learning environments within computer conferencing systems.

Computer conferences are "spaces" that require shaping, structuring, and topical sequencing to form an environment. Computer conferencing is a tool developed to enable distributed group communication. Shaping the features of the conferencing system into an environment for educational interaction requires significant and appropriate input by the teacher. Online education, like face-to-face teaching, requires structuring the learning events according to task, groups, and timelines. Collaborative or group learning activities can be reformulated to provide effective designs for the online environment. Following are selected group learning activities that have been found effective online:

- Seminars,
- Small group discussions,
- Learning partnerships or dyads,
- Small working groups,
- Team presentations/moderating by the learners,
- Simulations or role plays,
- Debating teams,
- Peer learning groups,
- Informal socializing: the online cafe,
- Mutual assist for help, and
- Access to additional educational resources.

Brief descriptions of each activity are provided below.

Seminars. An online seminar has many similarities to a face-to-face seminar. Students prepare by reading the assigned materials and then log on to discuss, debate, expand upon, and critique key issues. Students log on to the appropriate conference to type in comments and to read and respond to input from their peers and instructor.

Small group discussions. Small group discussions involve groups of three to ten individuals who focus on a particular topic, usually under the guidance of a group leader or the instructor. As with the face-to-face variety, an online small group discussion often follows a plenary presentation or seminar discussion, or it may complement a parallel online or face-to-face activity.

Learning partnerships or dyads. In a learning partnership or dyad, learners are paired for peer support or to undertake a task. Dyads can be used, for example, early in an online class to serve as an ice-breaker by providing each student with a peer in what is otherwise a new environment. Dyads are useful as well for a first assignment, such as a joint writing project.

Small working groups. Small working groups enable students to collaborate on an assigned task; examples include undertaking a research project, producing a report, or solving a problem. Teamwork online is possible even when members of the team live in different locations and are linked only by computer conferencing. Effective online teamwork requires clearly defined tasks, roles, labor distribution, and timelines.

Team presentations/moderating by the learners. Students in online classes can take on roles, such as leading class discussions, typically associated with teaching. Team presentations may involve writing and then posting (presenting) a report or paper online to a computer conference, where it is read and critiqued by peers and the instructor. This is typically part of a dyad or small group project. Students may also be asked to lead a topical discussion. One example involves having students work in teams of two to four persons to present, moderate, and synthesize a seminar on a class topic.

Simulations or role plays. Simulations or role plays enable learners to apply their theoretical knowledge in a simulated environment. Examples of role plays used successfully in online environments include an online 'management lab,' in which students take on various roles in managing a hypothetical corporation; an 'evaluation manor,' in which learners assume the personae/perspectives of various evaluators to debate evaluation approaches and procedures; and 'Sam's Cafe,' in which learners adopt the personae of characters in a bar to explore different philosophical perspectives and positions.

Debating teams. Debating teams allow learners an opportunity to deepen their analytical and communication skills by formulating their ideas and information to defend one position and critique the counter position. An online debate can be unstructured, with students responding to a stated position (and defending their position), or it can be structured, as in a dyad format in which participants are assigned a particular position on a topic.

Peer learning groups. Peer learning groups can be based on dyads or small groups, in which learners assist one another on various tasks (writing assignments, problem solving, etc.). For example, students may work together online to help one another improve their writing skills.

Informal socializing: the online cafe. Social communication is an essential component of educational activity and an online educational environment should provide a space, such as an online cafe, for informal discourse. The online cafe can contribute to a sense of community within the group, forging a social bond that can offer important motivational and cognitive benefits with the learning activities.

Mutual assist for help. An online help conference based on mutual assistance is a valuable tool for providing technical and system support. In a mutual-assist conference students can ask one another for help about using the system or share tips on how to use it better.

Access to additional educational resources. Most university computer conferencing systems provide access to other online resources such as international networks (Internet and Bitnet allow access to academic e-mail and user group services such as Comserve) as well as access to online databases, library catalogues, and similar information pools. These resources could be integrated into the design of online activities to benefit the curriculum.

Conclusion

Electronic media offer important opportunities and challenges. The role of computer conferencing in enabling group communication in education has evolved from supporting traditional teacher-student discourse to facilitating unprecedented forms of group learning. Asynchronous group work among geographically distributed individuals is a new phenomenon, but the growth of computer telecommunications will likely make online collaboration and networking an important part of education in the near future. The key factor to their effective use lies in the design of the online educational environment. In this monograph, Morten Flate Paulsen presents examples of innovative implementations of computer conferencing designs for educational delivery. These descriptions provide valuable perspectives for practitioners and researchers, and help to identify the steps ahead for this important new field.

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From Bulletin Boards to Electronic Universities

Distance Education, Computer-Mediated Communication, and Online Education

Morten Flate Paulsen

Introduction

This monograph is dedicated to Arachne–the finest mortal weaver ever, and Pygmalion–the talented sculptor whose passionate love literally enlivened his creations. May their spirits be guardians for CMC networks–the finest and most vivid networks ever woven.

The title, *From Bulletin Boards to Electronic Universities*, reflects the spectrum of educational Computer-Mediated Communication (CMC) systems from bulletin board courses, via online programs, to future electronic universities. This monograph presents a collection of separate papers that focuses on pioneering projects and their legacies from different perspectives. The consistent pivotal theme is computer-mediated communication and distance education. The monograph is divided into three parts. The first two articles, "The NKI Electronic College" and "Teaching Across the Atlantic," describe my experiences from NKI and Connected Education, the first two educational CMC projects with which I was involved. They have, beyond a doubt, formed a foundation for all my further CMC work. "Innovative Computer Conferencing Courses" and "Computer-Mediated Communication in Distance Education around the World, An Annotated Bibliography," in the second part, provide examples of the plethora of exciting CMC projects I have encountered through literature reviews and personal communications. Synthesizing some of my perceptions and theories, Part Three presents three articles that compile experiences, conclusions, and predictions for the future. "GO MEEC" describes a goal-oriented method for establishment of an electronic college, and "The Electronic University" predicts the development of future electronic universities. Finally, the "Hexagon of Cooperative Freedom" is a first attempt to establish a distance education theory attuned to CMC. The two main ideas in the theory are that adult students seek independence and cooperation, and that computer conferencing can facilitate these ends.

I want to thank the many people who contributed to this publication. The Annenberg/CPB Project provided financial support for the monograph. Linda Harasim and Robin Mason contributed the Foreword and the Afterword, respectively. Michael G. Moore, Peter S. Cookson, Barbara Grabowski, and Richard D. Taylor–faculty members at The Pennsylvania State University–gave valuable feedback on the articles. The editorial staff at The American Center for the Study of Distance Education, especially Melody M. Thompson, enhanced the quality of the final product. Finally, a thank you to Philip W. Pinder, who has always been available for inquiries.

Morten Flate Paulsen
The Pennsylvania State University
1992

PART ONE

The NKI Electronic College: Five Years of Computer Conferencing in Distance Education

NKI

The NKI College, located in Oslo, is one of the largest non-governmental educational institutions in Norway. Founded in 1959 as a correspondence school, NKI now comprises The College of Engineering, The College of Computer Science, The Division of Distance Education, and The Publishing House.

The Division of Distance Education offers sixty correspondence programs and 250 correspondence courses, mainly in technical and vocational subjects. The division has about 17,000 students and an extensive national network of local agency "partners" who join with NKI to offer face-to-face support classes adjunctive to many of the correspondence courses. The correspondence teachers are part-time employees recruited from around the country.

The College of Computer Science was established in 1983. It offers both a full-time and a part-time program in information processing, emphasizing programming and system analysis. Both are two-year programs, and every year about one hundred students in each category are admitted to the college. The part-time program is offered in three modes: face-to-face classes, correspondence courses, and the Electronic College. The Electronic College is designed so that distant students can do *all* of their communicating online in contrast to many of the internationally renowned "electronic colleges," which use computer conferencing merely as a supplement to correspondence courses or on-campus teaching.

The Electronic College

The idea of the Electronic College was conceived in 1985 and further developed by research on existing computer conferencing systems such as PortaCom, EIES, and CoSy, and on electronic colleges such as Connected Education and the Western Behavioral Sciences Institute (Paulsen 1989a). In the first two years, the project was propelled by a handful of enthusiasts who devoted much of their spare time to the project. The idea was to use computers to facilitate flexible interpersonal communication in distance education. Students, faculty, and staff would be able to communicate both individually and as groups independently of time and space through the college's central computer.

The Electronic College needed administrative and logistical support from The Division of Distance Education, and faculty and user support from The College of Computer Science. At first, few believed in the project, making it hard both to get the necessary support and to integrate the project into the NKI organization. Gradually, the Electronic College thrived, receiving both national and international

recognition. As a result, both The College of Computer Science and The Division of Distance Education wanted to take charge of the project. By the spring of 1992, the Electronic College had sold about 800 courses, but the organizational structure needed to be developed further.

The search for an appropriate software led to the development of the first version of EKKO—the Computer Conferencing Software emulating an electronic college. It was designed and implemented during 1986. The system was used for the first time, as an optional supplement to on-campus teaching, in the fall of 1986. The first attempt to deliver a distance education course via EKKO was made during the fall of 1987. Two more courses were added for the following semester. Since the spring of 1990, the college has offered all ten of the courses in the Information Processing Program every semester. These ten courses constitute the equivalent of a one-year, full-time program.

Participants

Including those in Spring Semester 1992, the NKI Electronic College has sold about 800 courses. An overview of the number of students who have enrolled and completed each course since Fall Semester 1987 is presented in Table 1.

Table 1. Numbers of Students Enrolling/Completing Courses Each Semester Since the Fall of 1987.

Courses*	F87	S88	F88	S89	F89	S90	F90	S91	F91	S92
Intro.	4/2	22/16	6/4	12/7	33/24	10/5	21/11	5/4	22/?	8/?
Pascal		19/9	7/4	9/4	23/15	26/20	22/10	7/6	24/?	15/?
Info. Sys. I		16/10	8/5	12/4	33/23	20/15	23/12	8/5	25/?	12/?
Intro. Bus. Adm.				7/2	3/2	2/2	17/14	3/2	7/?	9/?
COBOL Programming				3/1	4/4	12/11	9/8	7/7	5/?	11/?
Database Systems					4/3	18/16	13/12	9/5	12/?	5/?
Information Sys. II						20/17	12/11	20/13	12/?	15/?
Mgmt. Info. Sys.						5/5	4/4	20/18	4/?	8/?
Socio-Tech. Sys. D.						4/4	5/5	17/15	5/?	8/?
Project Assignment					1/1	3/2	0/0	12/10	4/?	8/?
Totals	4/2	57/35	21/13	43/18	101/72	120/97	126/87	108/85	120/?	97/?

*See Appendix 1 for complete course titles.

As of Spring Semester 1991, the student completion rate of all courses was 71%. The enrollment figures for each year depend on when enrollment information was gathered. In the few weeks before and after courses start, students frequently add and drop courses. The statistics for non-starters are not gathered, but observation indicates that many of the dropouts were non-starters, i.e., they did not complete any of the assignments.

A 1988 demographic survey of students (Paulsen 1989b) showed that the respondents were between 19 to 62 years old and that there was a substantial majority of men. Most of the students were married/ cohabiting and had children. Even though the majority of the students lived in the greater Oslo area, many came from other parts of the country, as well. The respondents were well educated; for example, several were teachers and engineers. Additionally, the students were relatively well-skilled computer users.

Needs

The College of Computer Science wanted to extend the part-time program to more students. Franchising and correspondence courses had been contemplated from the day the college was established. The computer boom in the second half of the 1980s propelled the demand for computer courses. However, no formal needs assessment for the Electronic College was conducted. How can one assess the need for concepts neither the consumers nor the providers comprehend? The Electronic College was obviously technology driven, and was promoted by people with a vision of an educational medium for the future.

Staff

The number of people involved with the Electronic College has increased as the project developed. The project administrator is the only full-time employee of the Electronic College. Over the years, about twenty part-time teachers have been engaged to teach courses. Some have taught only one course while others have taught two courses each semester for several semesters. The rest of the project work has been done on a part-time basis by NKI staff. The most important services are provided by the EKKO system operator, who is responsible for operation of hardware and software as well as for user support, and the course secretary, who handles enrollment and fees. Other important NKI staff responsibilities include course development, logistics, and development and administration of examinations. The extent of services provided by NKI staff varies from semester to semester, but can be estimated as equivalent to those of one or two full-time employees.

Content

The Information Processing Program emphasizes information processing, programming, and system analysis. The Program, as described in the 1991-92 handbook (NKI 1991), is primarily developed for users of computers and software applications. The responsibility for using computers is increasingly transferred to the users, so there is a need for people who can assume responsibility for local computer applications. These people need—in addition to their ordinary job assignment skills—enough knowledge about the use of computers to understand the opportunities computers provide, and to participate in the

implementation of computer projects. The program provides knowledge about the opportunities made possible by computers. The students develop knowledge about information processing, allowing them to take part in system analysis and development as well as programming. They will be able to develop small scale information systems and modify existing systems. It is, in particular, pertinent that they can apply these skills in their work environment.

Finances

Public schools, colleges, and universities charge no tuition fees in Norway. Thus, the non-governmental NKI has to compete with public colleges in an unfavorable financial environment. For this reason the Electronic College, like most NKI projects, was developed under economic constraints. Grants to support the project were limited; hence, it was necessary to settle on pragmatic, low-cost solutions which seldom were optimal for the new medium.

The two important economic resources were student fees and research grants from the Norwegian Department of Church and Education and the Norwegian Teleadministration. In five years, the research grants have totaled about $100,000.

The Electronic College's fee structure developed over several semesters. For the first and third semesters, each course was priced at the rate of the equivalent correspondence course. It was decided that courses offered the second semester should be free (with students paying only for textbooks) in order to encourage enrollment of enough students to give the college experience with larger classes. By offering free courses, the college received positive and free media exposure for the, until then, esoteric concept of "electronic distance education." For the fourth semester an additional $25 (NOK 150) communication fee per course was introduced. Finally, in the fifth semester the communication fee was converted to a $150 (NOK 1,000) semester fee. The communication fee and the semester fee covered the use of EKKO and all data communication costs except local telephone charges.

The course fee, which covers tuition and textbooks, has varied from course to course, increasing at a rate slightly higher than that of inflation. It has ranged from approximately $300 to $500 per course. Students must pay an extra $100 to take the course examination. As an incentive to complete courses, students receive a $50 refund—payable toward another course—for each course they complete.

Facilities

The Work Station. The college does not require students to use a specific brand of microcomputer, modem, or communication program; however, they must be able to upload and download ASCII files via EKKO. The college does not provide or rent any equipment to the students; consequently, logistics are greatly simplified.

Communication Lines. During Spring Semester 1988, the use of EKKO was logged continuously. The use varied considerably from student to student. Among students who completed one or more courses, the number of "log-ins" varied from once a week to several times a day. The minimum number of log-ins during the semester was eleven; the average was about eighty and the maximum number was 350.

EKKO provided two Public Telephone and Telegraph (PTT) lines for 300 bit/sec modems and two autodetect PTT lines for 1200 and 2400 bit/sec modems. Also available were six Public Data Network (PDN) channels. These lines were available not only for our distance students, but also for other users.

The communication lines were used at almost any hour of the day. The peak frequency occurred during the afternoon and evening and the frequency dropped to a minimum at night. The four PTT lines and six PDN channels have had the capacity to handle all the users during experiments carried out so far. EKKO paid for the students' use of the PDN. In 1988, the fixed PDN costs were $293 and the average variable cost for each of the fifty-seven courses was $22 (Paulsen and Rekkedal 1990a).

User Support. The Electronic College has few resources for user support. As a result, marketing focuses primarily on students who can master the communication system with minimal help from the college. Financial resources budgeted for user support are used primarily for production and distribution of user manuals and communication software. Additional student assistance is available by telephone during work hours or by posting questions in EKKO.

Organization of User Groups, Conferences, and Bulletin Boards

EKKO's 3,000 individual users include on-campus students, prospective students, present students, former students, teachers, and administrative staff. Table 2 gives an overview of how EKKO is organized to serve these users and their different needs.

Prospective students seek information about the college, the curriculum, the conferencing system, etc. They need access to sufficient information to decide whether to apply for a course. If they decide to apply, they should be able to both apply and register online. To reduce the labor-intensive counseling of prospective students, the college has given them the access privileges necessary to search for information themselves. They have access to the Curriculum Board, the User Manual Board, and the Published Articles Board. Everyone in Norway has free access to EKKO. The college continuously announces how to access EKKO, so prospective students and "hackers" can get acquainted with the system. Providing this access might be the program's most valuable marketing activity.

Present students need tutoring, administrative information, and social recreation. It is necessary to organize a suitable infrastructure for these purposes. The College has established Course Conferences and Course Boards for tutoring, a Cafe Conference for social activities, a Presentation Board where students can introduce themselves, and Administrative and Exam Boards for administrative and examination announcements.

Former students may want to know when new courses are offered or may desire to stay in touch with

old classmates. The college has given them free access privileges, hoping that continued online access may develop an important alumni network.

Table 2. User Groups' Access Privileges to EKKO Conferences and Bulletin Boards.

Conferences/ Bulletin Boards	Prospective Students	Present Students	Former Students	Teachers	Staff
Curriculum Board	RO	RO	RO	RO	RW
User Manual Board	RO	RO	RO	RO	RW
Published Articles	RO	RO	RO	RO	RW
Admission Office	N	N	N	RO	RW
Faculty Club	N	N	N	RW	RW
Administrative Board	RO	RO	RO	RO	RW
Exam Board	N	RO	N	RO	RW
Course Boards	N	RO	N	RW	RO
Course Conferences	N	RW	N	RW	RW
Cafe Conference	N	RW	RW	RW	RW
Presentation Board	N	RW	N	RW	RW

N = No access, RO = Read Only access, RW= Read and Write access

Teachers have Course Boards for distribution of information to their classes. Each also moderates a Course Conference. All teachers can access any Course Board or Conference to pick up different pedagogical ideas and approaches. The Faculty Club is set up for discussion of administrative and pedagogical issues.

The staff is responsible for distributing administrative information. EKKO provides a Curriculum Board, which duplicates the printed program handbook. The User Manual Board is an online version of the printed manual. Published articles and papers describing distance education projects are issued on the Published Articles Board. The Administrative Board holds information about registration fees, application deadlines, etc. Selected examples of former examinations are presented on the Exam Board. The program secretary receives course orders via e-mail, phone, or land mail, and informs the System Operator and the teachers via the Admission Office Board whenever students enroll in courses. The System Operator then grants the students the appropriate access privileges and the teachers welcome them as students.

Teaching

EKKO courses are based on the texts and curricula developed for the corresponding face-to-face courses. In addition, all courses include a study guide originally developed for the correspondence courses. However, the developers of the study guides are becoming increasingly aware of the fact that these guides also are used by the EKKO students. Most courses are based on six compulsory assignments. On occasion, EKKO teachers substitute alternative assignments in order to experiment with

other pedagogical techniques. Students can send their work as e-mail to the teacher or as notes to the class conference.

To create group cohesiveness and to support student collaboration, students within each course must experience a synchronous progression. The college therefore applies fixed dates for both the beginning of a course and for the final examination each semester. This policy is in contrast to that for correspondence courses, in which students may enroll at any time.

Since the courses are based on correspondence courses which have been adapted to a new medium, they may be criticized for being nothing more than electronic correspondence courses. The following examples of aspects of EKKO courses serve to refute this criticism.

Projects. The Project Assignment Course was taught by this author during Spring Semester 1991. The coursework involved collecting information both by conducting interviews and through a literature search. An important goal was to familiarize students with project management and cooperation. A second objective was to teach students how to produce a written report of the project results. The students were encouraged to find projects related both to knowledge obtained through the Information Processing Program and to their jobs. They were asked to form project groups of from one to three students.

Each student received two textbooks by land mail. In addition to the textbooks, the students received a fifteen-page study guide that was developed for both correspondence students and EKKO students. The guide included extra guidance for distance students, course requirements, and assignments. Since development of the study guide was finished a few days after the course started, it was distributed via EKKO.

Twelve students, ten men and two women, enrolled in the course, which for most of them was the tenth and final course in the program. By this time they had all become advanced computer conferencing users with no need for user support. Most of them had enrolled in more than one course in Spring Semester 1991.

The course started the first week of February 1991; the final project report was due May 10th. During this period the students had to complete four assignments. The first assignment covered the theory introduced in the textbooks. Each student had to turn in a short essay via e-mail, and students were asked to present project ideas in the class conference. For the second assignment, the students had to form a project group and then present their project task, milestone plan, and responsibility chart. The third assignment asked each group for a written progress report, and the fourth assignment was a final project report.

The teacher's job was to comment on the assignments and to help the students whenever they had questions about their projects and the project management tools. Most of this feedback was routed via e-mail to each specific group, but information of general interest was posted on the class bulletin board or in the class conference.

Role Play. In the fall of 1988, Monica Johannesen taught "Information Systems I" via EKKO. In a class conference, she presented a case that described a company planning to invest in a new computer-based office automation system. The students were assigned roles as user, accounting officer, project manager, labor union representative, etc. Over a period of about fourteen days the students were to elucidate the different facets of the case by enacting the different roles.

Peer Critique. In the course "Management Information Systems," this author practiced a technique by which the students presented the results of their individual assignments in a small group conference. The students' peers were then asked to critique the work.

Multiple Choice Database. Henny Lindland used the EKKO-based online multiple choice database, described by Quale (1990), as part of "Introduction to Computer Science" for the first time in the fall of 1989. The students could first download a number of multiple choice questions, then determine and later upload the answers for scoring by the database software.

Programming. Beginning in the fall of 1988, Ragnar Børsum taught several programming courses. In the Pascal course, students used Turbo Pascal to develop programs on their home microcomputers. The program source code was posted to the instructor or shared with the other students in the conferencing system. In this way the teacher and the students could download the programs, modify them if they chose, and then execute them on their local computers. The Cobol course allowed student access to the host computer's Cobol compiler. Although this method was inconvenient, it was workable. The important lesson was, however, that distant students can access host computer applications such as compilers, database systems, statistics software, etc.

Grades

Grades are exclusively based on the results of the final four-hour essay examinations. EKKO students, correspondence students, and on-campus students are given the same tests at the same time at several sites around the country. The results show that EKKO students achieve better grades than either correspondence students or on-campus students. On a scale from 1.0 (best grade) through 4.0 (lowest pass grade) to 6.0 (lowest fail grade), Table 3 presents the total average grades from Fall Semester 1989 to Spring Semester 1991.

Three factors may explain these differences in grades. First, EKKO students seem to enter the courses with a better educational and work background than do on-campus and correspondence students. Second, EKKO students have more compulsory assignments than do on-campus students. Third, the communication form they are required to use forces EKKO students to write more than on-campus students must write. This necessity probably provides EKKO students an advantage over other students since it better prepares them for the typical four-hour essay-style exam. An overview of examination results are included in Appendix 1.

Table 3. Total Average Grades.

Student group	Mean grade	N	Semesters
EKKO	2.57	288	Fall 89 to Spring 91
Correspondence	3.05	125	Fall 89 to Spring 91
On-campus	2.89	889	Fall 89 to Fall 90

Feedback From Teachers

This author summed up the teaching experiences of the seminal Spring Semester 1987 in these three points (translated from Paulsen 1989b, 17):

1. My main impression is that we did not manage to utilize the opportunities to create class cohesiveness. I believe this is because there were too few students in the class [four students] and because the students did not have a synchronous course progression.

2. The teaching was mainly an electronic version of a traditional correspondence course. The response time was shorter than what is usual in correspondence courses, which I perceived as an advantage. I had, though, to experiment to find an effective way to comment on the students' assignments.

3. The students had obvious problems in learning how to use a modem. As a teacher, I would like to have a support service that could help the students solve these problems.

By Spring Semester 1988, there were more students in the classes, the course progress was synchronized, and the student support had improved. Lars Eskeland and Rolf Ingebrigtsen wrote extensive reports about their teaching experiences during this period. Their reports, which are available in Norwegian (Paulsen 1989b), stated that it had been an interesting and work-intensive teaching method, but that their work could have been more efficient had EKKO been better adapted to the teachers' needs. They also suggested that the teaching would be less work intensive the next time the courses were offered because many of the text files could be used again.

In the fall of 1988, all the material from the previous semester was made available to new teachers in order to reduce their workload. Some changes in the EKKO software were also implemented to make the teachers' work more efficient. Roy Lindland, Ragnar Børsum, and Monica Johannesen were interviewed about their teaching experiences during Fall Semester 1988 (Paulsen 1989b). They reported that they were pleased with the opportunity to work when it was convenient, and disturbed by the fact that it was hard to initiate communication in class. They recognized that the instructor's workload was large, but believed that it would decrease when the courses were repeated. These teachers suggested that pedagogical techniques that stimulate dialogue between the students were needed and that courses that rely heavily on graphical representations are not suited for this kind of teaching. When these courses were taught, the problems associated with sending and receiving graphic files in EKKO were handled by quasi keyboard graphics,

fax, or land mail. Later, an updated version of EKKO was developed to handle uploading and downloading of graphics and other binary files.

Ragnar Børsum (1990) described his teaching experiences in the Pascal and Cobol courses in 1988 and 1989:

> I logged on to EKKO twice a day as long as I was in the vicinity of my PC. I received the information in a file and logged off the system. Then, I wrote my comments, logged on again, and dispatched my comment files.
>
> The students' notes and my corresponding comments were filed in the students' directories. I established one directory for each student. The comments were identified with references to the assignment number and question number. I believe it is important that the comments are written in a "friendly way." Emotions are hard to express in this medium, and they are easily misunderstood. One should have this in mind when one reads student contributions.
>
> The workload is heavy when one teaches such a course for the first time. One needs a lot of notes and files compiled in a system. (translated from Børsum 1990, 108)

Henny Lindland taught "Introduction to Computer Science" in 1988. On the basis of this experience, she concluded that the course is suitable for electronic distance education, that effective use of EKKO can to a large degree simulate a classroom, and that the EKKO-based software is a valuable tool (Lindland 1990).

Ragnar Børsum, Einar Gaarder, Steinar Heggelund, and Henny Lindland responded to a thirteen-item questionnaire about teacher experiences during Fall Semester 1988 (Paulsen and Rekkedal 1990b). Their comments include details about the specific courses, how the courses were taught, and how they could be improved. All four agreed that the workload was heavy.

Feedback From Students

There was no organized survey of the four students' opinions from Fall Semester 1987. The following student statement is, however, documented:

> Generally, I evaluate the scheme very favorably. It is right on target to offer a system pairing correspondence courses and evening classes. One may compare it with "combined courses," a combination of correspondence courses and lectures, which I have favorable experiences with from high school courses. In my opinion, it is wonderful not to have to attend five-hour lectures twice a week after work. (translated from Paulsen 1989b, 17)

In Spring Semester 1988, questionnaires were distributed to forty students. Twenty-eight were completed and returned. These questionnaires provide valuable information regarding student attitudes toward various aspects of their CMC experience (Paulsen 1990a).

In most cases, the students gave a positive overall assessment of this form of distance education. None of the students who expressed views was dissatisfied with the course. On a scale from 5=very good to 1=very poor, their average estimates of the three courses were 3.9, 4.3, and 3.9, respectively.

The two main reasons given for being interested in the course were the subject matter and the communication medium. Distance students had a relatively good grounding in the use of computers and

computer science prior to taking the EKKO courses. Most of them, but not all, already had experience with word processing and/or a PC/microcomputer. However, there were remarkably few who had experience with modems and/or conferencing systems before starting the course. The 1200 bit/sec users were generally satisfied with the transmission speed, but the 300 bit/sec users were not. In general, students were satisfied with the lines of communication. The PTT users were little disturbed by noise, but the problems increased with transmission speed. The PDN users claimed to be more disturbed by noise on the lines.

Most distance students lived in the Oslo area, although other parts of the country were also represented. EKKO distance education courses have attracted students with a good educational background and a wide variety of vocations. A great majority of the students are married or cohabitating, and have children. There were significantly more men than women among the students.

The textbooks and assignments for submission were developed for traditional correspondence courses. A large majority of the students felt that this had not hindered them in their learning. It is therefore possible to offer instruction without materials specially developed for courses of this kind.

Students reported that tutors' individual responses to their assignments and the chance to communicate with tutors via e-mail, were very important to them. They were satisfied with the tutors' response time.

Instruction was planned with fixed deadlines for submission of assignments in order to synchronize progression through the courses. This was a positive aspect for both students and teachers. However, everyone not completing the course claimed that lack of time was the main reason. Perhaps the deadlines for submission of assignments should not have been as frequent as every second week. The main reasons given for not taking the final exam were lack of time or lack of interest in formal accreditation.

One student's evaluation of the Pascal course in Fall Semester 1988 states: "The electronic distance education developed to become a sort of electronic correspondence teaching" (translated from Paulsen 1989b, 48). Statements such as this reflect the need for better pedagogical techniques.

On the basis of a comprehensive telephone interview with 20 EKKO students, 26 correspondence students, and 20 prospective EKKO students, Rekkedal (1990) concludes:

- Experiences from Spring Semester 1989, previous experiences, and data from Fall Semester 1989 have shown that distance education through the EKKO computer conferencing system has functioned quite well.
- The NKI Information Processing Programs can now be studied in four different ways: full-time and part-time on campus, correspondence studies, and electronic distance studies. These alternatives seem to reach different target groups, thus providing study opportunities for prospective students with different needs.
- Correspondence studies and electronic distance studies seem today to attract different student groups, who deliberately choose their preferred method.
- There is a need for better information dissemination to prospective students about what electronic study involves in terms of technological problems and costs.
- Lack of modems and familiarity with the technology involved is still a major barrier for recruitment to electronic distance studies. There is a need for making the communication commands and procedures easier for novice users.

- We see a great need for developing theoretical frameworks and methodological experiments to find teaching methods and learning techniques suitable for different subjects, types of objectives, content, and evaluation procedures.

- Research is needed to find teaching methods which stimulate meaningful course-related and social communication. In this work it is important to develop teaching behaviors that stimulate active student contribution. Since teaching through computer-mediated communication seems to be extremely demanding and time consuming, we also need to develop procedures which lead to cost-efficient teaching. (Rekkedal 1990, 103)

Responses from twelve students from Fall Semester 1989 were recorded and analyzed (Paulsen and Rekkedal 1990b). Following is the final paragraph of the report, based on these responses, that was returned to the students:

> I am pleased to notice that most of the comments I received relate to teaching and learning. Very few comments report technical problems, even though we know that they still exist. I consider this to show that we can concentrate in the future on the important issues, namely on quality education. (translated from Paulsen and Rekkedal 1990b, 54)

A 1991 e-mail interview with students who had graduated asked the following question: What is your opinion of the NKI Electronic College now that you have finished all ten courses? The complete set of answers (Appendix 2) showed that the five respondents were positive about the freedom provided by the Electronic College and about the program content. They also point out that teacher activity is crucial to students' perceptions of a course. This conclusion is supported by these two student comments:

> Some of the teachers should have been more active in trying to "drag the students into the conference." What I think is a problem . . . is that there are some teachers who are taking this job as a "secondary job" and consider it as a secondary job. They are not interested in answering questions in the conference, just in giving us exercises and in correcting our written work. It sometimes made me quite frustrated when I put a question into the conference and I didn't get the answer until the date for delivering my exercise was there. (see Appendix 2)

> In my opinion, the teachers are the most important parts of the program. They should always be very active and sensitive to questions posted by students. With regard to this, the differences between the various courses has been considerable. A teacher who continually monitors the activity and who responds promptly is a prerequisite for an effective program with motivated students. Some teachers have been terrific, others rather slack. (see Appendix 2)

Administrative Feedback

In the view of Bitten Tollan, the program secretary,

> EKKO is a very efficient communication medium. Information and orders can be executed much faster than via ordinary mail. As long as EKKO students are not registered in the existing computer systems developed for our correspondence students, the administrative tasks are very work intensive. Much time and work can be saved when the EKKO students can be registered automatically. (translated from Paulsen 1989b, 53)

Since this statement was made, much work has been done to make the administrative work more efficient. However, there is room for improvement of both manual and automatic routines. A discussion of possible future administrative applications within EKKO is presented in Paulsen (1990b, 110–12).

Conclusion

The NKI Electronic College has proved its value through five years of operation, the delivery of 800 courses, and, to date, 20 graduated students. These students have completed a ten-course program—equivalent to one year's full-time study—via computer conferencing. Further, the students have obtained better grades than either correspondence students or on-campus students. Surveys show that the students have a positive perception of the curriculum and the Electronic College. Student feedback also indicates that teacher activity is of crucial importance to students' perception of a course. The teachers are generally positive about the Electronic College and its opportunities; their main reservation is in regard to the heavy teacher workload introduced by the medium. This perception highlights the importance of continued efforts to identify and refine efficient pedagogical techniques for the future Electronic College.

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Appendix 1.
Examination Results Fall 1989–Spring 1991

Most of the exams were prepared by teachers who taught the face-to-face students. The grades are presented as averages, because averages are automatically computed by the administrative software. On a scale from 1.0 (best grade) through 4.0 (lowest pass grade) to 6.0 (lowest fail grade), the students achieved the following grades:

	Average grades				Number of students				Number of students failed			
	F89	S90	F90	S91	F89	S90	F90	S91	F89	S90	F90	S91
EKKO Students												
1	2.58	3.17	3.10	2.40	18	3	10	5	0	0	2	0
2	2.66	2.50	3.00	2.75	22	3	13	4	1	0	2	0
3	2.38	2.47	2.70	1.33	12	16	10	6	1	1	1	0
4		2.50	2.65	2.45		18	10	11		0	0	0
5	2.00	2.60	2.44	2.00	4	10	9	7	0	0	0	0
6	2.50	2.75	2.64	3.25	2	2	14	2	0	0	0	1
7	2.00	2.93	2.83	2.70	3	14	12	5	0	3	0	0
8		2.60	2.00	2.43		5	3	14		0	0	0
9		2.75	2.60	2.38		4	5	12		0	0	0
All	2.50	2.64	2.75	2.34	61	75	86	66	2	4	5	1
Correspondence Students												
1	3.80	3.60	2.96	3.30	5	13	14	10	1	1	1	2
2	2.70	3.27	3.25	2.54	5	11	8	13	0	2	1	0
3	2.25	3.17	3.45	3.05	6	3	10	10	0	1	3	2
4			2.50				2				0	
5		3.50	1.75	3.50		2	2	1		0	0	0
6	2.50	2.50	3.00	2.17	4	2	1	3	0	0	0	0
7												
8												
9												
All	2.80	3.40	3.07	2.88	20	31	37	37	1	4	5	4
On-campus Students												
1	2.69	4.53	2.69		61	3	56		6	2	4	
2	2.95	2.50	2.72		55	2	39		6	0	1	
3	3.48	3.86	3.35		54	8	58		18	3	12	
4		2.61				71				5		
5		3.43				60				17		
6	2.74	2.75	3.04		68	2	54		6	0	11	
7	2.59	2.94	3.05		73	20	32		3	0	7	
8		2.63				85				1		
9		2.69	2.68			71	17			2	1	
All	2.86	2.86	2.96		311	322	256		39	30	36	

1=Intro. to Computer Science
2=Information Systems I
3=Pascal Programming
4=Information Systems II
5=COBOL Programming
6=Intro. to Business Admin.
7=Relational Databases
8=Management Information Systems
9=Socio-Technical Systems Development

Appendix 2.

Opinions of NKI Electronic College Graduates

Question: What is your opinion of the NKI Electronic College, now that you have graduated?

Solfrid Grøndahl: I feel this is a difficult question for me to answer, though I have been a student at this College for nearly 2 1/2 years. First of all I want to say that I am grateful for the possibility this College has given me to take higher education without having to leave my house.

I also feel that the different courses and textbooks (all printed material) are of rather high quality, and most of it is written in a language that makes it quite easy to understand. This is important because being a student at this Electronic College is a rather lonely way of studying. Of course you have the possibility of asking the teacher, "putting" your questions into the conference, but this covers only small parts of the curriculum. Most of it you have to read, study, and understand by yourself.

To get through, you need a great portion of self-discipline, because the studies take most of your spare time. There is not much time left for your family and other social activities. It is of course easier being a student at an ordinary school, because then a great deal of the curriculum is being explained to you, but I think you learn and remember better when you have to study everything by yourself.

Some teachers have given me a lot of supplementary documents on the subject, and these have been of great help to me.

The fixed dates for delivering written work are of great help because they force you to work "all the time." The conferences created for those taking the same subjects are a good idea, even if I feel they haven't had the mission they were thought to have. Some of the teachers should have been more active in trying to "drag the students into the conference." What I think is a problem for NKI is that there are some teachers who are taking this job as a "secondary job," and consider it as a secondary job. They are not interested in answering questions in the conference, just in giving us exercises and in correcting our written work. It sometimes made me quite frustrated when I put a question into the conference and I didn't get the answer until the date for delivering my exercise was there.

Because I have been a rather active student, I have got a lot of new friends all over the country. I like this way of studying, first of all because I don't need to leave my house. What I feel is good is, of course, the possibility of getting University studies in my own house. You have, however, to do most of the studies on your own, so it's a hard way... (Originally written in English)

Finn Kylland: I have a very positive impression of an electronic college. With modern datacommunication technology, it is much easier to transfer information than people. An electronic college can offer students a combination of flexibility, freedom, and efficient teaching, unattainable in traditional schools. With this in mind, Norway should offer electronic college programs at least as widely as traditional college/university programs. (Translated from Norwegian)

Ole Salomonsen: Using EKKO, I was able to study while I lived 500 kilometers away from the nearest college. EKKO has substantial advantages compared to information exchange via mail—especially the swift feedback on the assignments.

Technically, EKKO has worked nearly perfectly for me. I had some problems adapting my communication software, but it worked well after a while. I have used Procomm Plus/Galink/Telix for communication.

Taking part in education as a distance/part-time student has suited me perfectly. I could not pursue continuing education without moving, for instance to Oslo, with all the problems that would entail for my

family. Neither would I be able to keep up with the technological developments at my work place. (Translated from Norwegian)

Eva Reppen: I think NKI's electronic Information Processing Program offers an excellent way of studying. I live in a rural area and I worked full time while I was studying. I had no other opportunity than this program for continuing education in information processing.

Electronic programs are obviously the solution of today. First, it doesn't matter where you live. Second, the communication between the school and the student can be swift. Finally, you experience a cohesiveness with other students so that you don't feel as if you are studying alone.

Personally, I appreciated rigid deadlines. In that way I had to work hard, even though it has often been tough to hang on. In my opinion, the teachers are the most important parts of the program. They should always be very active and sensitive to questions posted by students. In this regard, the differences between the various courses have been considerable. A teacher who continually monitors the activity and who responds promptly is a prerequisite for an effective program with motivated students. Some teachers have been terrific, others rather slack.

I have here expressed both praise and criticism. Thank you for having me, and I wish you good luck with future electronic distance education. It is possible that I will register for more courses if I find something of interest. Since I have tried electronic distance education, I am unlikely to ever again register for a correspondence program; I have become too selective. There is a tremendous difference between these two modes. I recommend the program to others and I have already found you another student from my county. Maybe I can find some more in the future. (Translated from Norwegian)

Stein Korten: As a student at the NKI Electronic College, I am not required to attend lectures two or three days a week. With a demanding job and two small children at home, I have obviously little spare time. So, the NKI Electronic College suits me perfectly. I can study when it is convenient without being dependent on teachers and co-students. I am also very pleased with the curriculum. A broad range of topics is included. One may start to cover the basic concepts and then progress as one prefers. The only thing I miss is the opportunity to choose certain subjects for in-depth study. (Translated to English from a statement given in an NKI brochure)

Teaching Across The Atlantic: The Connected Education Experience

This article describes the course "Issues in International Telecommunication" delivered by Connected Education in June and July 1988. It further discusses the course with regard to Wager and Gagne's (1988) nine events of learning. The course was conducted by one teacher and three guest experts from both sides of the Atlantic. Communication was via PC to EIES, a computer conferencing system at New Jersey Institute of Technology.

Connected Education

Connected Education (CE) is a small New York City-based company founded and directed by Paul Levinson (Levinson 1985; 1989; and 1990). The company is regarded as an international pioneer in computer-conference-based distance education. CE has successfully established online professional, social, and administrative college environments for distance students. Since 1985, CE has enrolled several hundred students from many countries.

With just two employees, CE depends completely on services—such as course accreditations, conferencing services, and instruction—provided by contractors. The courses are accredited by The New School for Social Research as part of their program in Media Studies. CE pays New Jersey Institute of Technology (NJIT) for use of the EIES conferencing system, and the teachers are engaged on a part-time, per course basis.

EIES is one of the oldest and most comprehensive computer conferencing systems in use. The system was developed at NJIT by Murray Turoff and his team (Turoff 1982; Turoff and Hiltz 1986; and Hiltz 1985, 1988a, and 1988b). EIES can be reached from around the world via international packet-switched networks (X.25) such as Telenet in the United States and Datapac in Canada.

Connected Education's students are enrolled at, and receive their grades from, the New School for Social Research. The teachers also receive their paychecks from the New School. Students may now become Masters in Media Studies, majoring in Technology and Society, completely through CE online courses. Connected Education is also developing a Ph.D. program in Philosophy and Technology in collaboration with the New York Polytechnic University.

For Summer Semester 1988, CE and the New School collaborated to offer these four courses:

- Issues in International Telecommunication,
- Cybernetics and Poetry,
- Introduction to Software Documentation, and
- On-Line Journalism.

Each course gave three credits and cost $888, which covered tuition and communications within the United States. A description of one of these courses follows.

The course "Issues in International Telecommunication" examined the growing use of telecommunications across national boundaries in business, entertainment, and education. The course focused on necessary technologies and on the legal, political, and social effects of such cross-pollination. Issues included existing national laws and customs that regulate transnational communication and the changing balance of centralization and decentralization as a result of increasing availability of satellite dishes and personal computers. The coursework also included generation of proposals for improvement of international telecommunications.

Paul Levinson taught the course—partly from his home office in New York City and partly from his "electronic cottage" at Cape Cod—with three guest experts: Jerry Glenn, Terence Wright, and this author. Jerry Glenn, an expert on implementation of telecommunications systems in Third World countries, lives in Washington, DC. Terence Wright, a telecommunications consultant living in London, is interested in telecommunication development in European Community countries. Finally, this author, as a Norwegian computer conferencing expert, was asked to report on current telecommunication events and trends in the Scandinavian countries. It was interesting to observe how well the system handled collaborative teaching (Hiltz, Shapiro, and Ringsted 1990), because EIES recorded all our contributions in the conference.

Seven students enrolled in the course. They were all resourceful, well-educated, part-time students in demanding professional positions. Gail, from Jamaica, works with the United Nations Development Program in New York City. Marshall, from Taiwan, moved to New York City in 1985 to work for the *Taiwan Tribune*. Tobin lives in Dallas, Wallys is a researcher in Minneapolis, and Denise lives in Nashville. John and Michael both live in New York City.

Connected Education established one conference, dedicated for the course. Both students and teachers had "read and write" access to the conference. During the two-month course, 256 comments were written, filling 250 pages of text. Together, the comments comprised the required readings. The activity was initiated by Paul Levinson, who welcomed the students and presented the course framework. He also presented the focus issues for each of the eight weeks. The first several days were used for student and teacher presentations. Next, the course topics were addressed. The teachers introduced each new issue and answered questions posted by the students. The students often added valuable views and examples. The learning process was very group oriented, with both students and teachers contributing knowledge and experience.

Toward the end of the course, Paul Levinson staged a role play in which participants chose roles and organizations they wanted to represent. The participants had to comment on issues and viewpoints relating to telecommunications. Role plays are interesting collaborative tools in computer conferencing pedagogy. However, role plays need careful planning and strict casting. Too much improvisation, as in this CE course, can never be completely successful. Finally, the students were graded based upon their participation during the course and role play, as well as on a final paper submitted by e-mail.

Extracurricular Activities

In addition to the four course conferences, Connect Ed Cafe is a private conference for CE students, faculty, and staff. About 150 members used it for social communication. There was a high level of activity and a wide diversity of issues discussed. One interesting feature was the opportunity to meet students and teachers from other courses, and to hear their opinions about those courses.

Synapse is the CE's electronic newsletter for conveying relevant articles and information about CE. The newsletter is a useful tool for information dissemination and for consolidation of relations between students and CE. Additionally, CE has established an electronic library of articles that students may download. The articles are both used in courses and available for other interested readers. Most of the articles are related to computer conferencing.

Students can order books through the electronic "bookstore," which is a list of available literature and a person who processes book orders through e-mail and who then dispatches the order via land mail. In the Faculty Club conference, the teachers and staff can discuss administrative, technical, and pedagogical issues.

Connected Education enrolls many international students. Those for whom English is a second language are obviously at a disadvantage. Although incorrect written and oral language are common and accepted, CE offered an English tutor to monitor foreign students' comments and to give them personal feedback via e-mail.

Discussion

Wager and Gagne describe nine events of learning and state that any complete act of learning involves these nine events (Wager and Gagne 1988). An instructional designer may, however, choose to omit events based on his or her knowledge of the learning task or the learning group. The nine events of learning are: gaining attention, informing the learner of lesson objectives, stimulating recall of prior learning, presenting stimuli with distinctive features, providing learning guidance, eliciting performance, providing feedback, assessing performance, and enhancing retention and learning transfer. Each event will be discussed in relation to the CE course.

Gaining attention. Response to a pioneer course such as this one may be influenced by the "Hawthorne Effect," an increase in interest, favorability, and motivation to do well when faced with a new situation. For this motivated group of students, the use of CMC could be sufficient to gain the necessary attention. The international aspect of the course and the teachers' skillful introductions seemed to raise attention further. Under other circumstances, the lack of additional media, such as print or face-to-face meetings, could result in insufficient attention. After all, ASCII text provides relatively few sensory stimuli.

Informing the learner of lesson objectives. The course description, as presented earlier in this article, was not extensive. The course objectives and the issues to be discussed each week were equally brief. A

course like this one, in which students have access to experts from several countries, should obviously allow the class to improvise and pursue issues of special interest. However, it could be argued that the objectives for the course should be stated more distinctly.

Stimulating recall of prior learning. Recall was deliberately stimulated by the moderator's questions and comments. Further recall took place during general discussion and in the writing of final papers.

Presenting stimuli with distinctive features. Although the instructors and students in this class were "masters of the medium," CMC deprived them of many tools usually employed in the learning process. These are graphic features, color, and sound, just to mention a few.

Providing learning guidance. Pre-course information gathered from students indicated that they were an experienced group for whom learning guidance was not a priority issue. This assumption was substantiated during the operation of the course.

Eliciting performance. Students were required to take part in group communication, in the role play and to write a final paper. These requirements elicited sufficient examples of student performance.

Providing feedback. CMC provided excellent opportunities for feedback in this course. Quality feedback was regularly given by both teachers and peers in the group conference. In addition, feedback could be given individually via e-mail.

Assessing performance. Each student's performance in the conference was continually, but informally, assessed by instructors and peers. Compulsory lessons or formal responses were not required; however, general participation in the group communication and submission of the final paper was mandatory. Compared to most distance education courses, the formal assessment in this course was minimal.

Enhancing retention and learning transfer. Students were encouraged to consider what impact the discussed issues could have on their jobs. In addition, both the role play and the final paper were expected to enhance retention and learning transfer.

Conclusion

A course can always be improved. Analysis shows that this course tended to be too loosely organized. It lacked textbooks and other pre-produced material; the syllabus was just the information posted by teachers and students in the conference. Reliance on CMC as the only instructional medium limited the variety of the learning events. Further, it was hard to separate important information from the less essential, and evaluating the quality of some notes was difficult.

Teaching and observing the activity was an exciting and instructive, but work-intensive, experience. The course, without doubt, could be improved by better planning and some pre-produced material, but it could hardly be more up-to-date. More important, though, is that Connected Education has managed to create a professional, administrative, and social online college environment that in several ways could serve as a useful model for future electronic colleges.

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PART TWO

Innovative Computer Conferencing Courses

In the late 1980s the number of distance education courses taught via computer conferencing increased dramatically. Most of them attempted to replicate traditional teaching in a new medium, with little innovative use of the technology. Ideally, however, what we should expect in distance education pedagogy is a paradigm change based on the opportunity to conduct asynchronous group communication. Some early articles discuss the pedagogical opportunities of computer conferencing (Davie 1989, McCreary and Van Duren 1987, Harasim 1991, Eisley 1991), but considerable experimentation and research remains to be done. This literature review compiles some evidence of an impending paradigm change, and sources indicate that there are additional innovative and remarkable courses available. This article describes and discusses the following innovative examples of computer conferencing in teaching:

- The International Business Negotiation Simulation course (University of Maryland), in which the term "virtual synchronous communication" was coined.
- The Introduction to Information Technology course (The Open University, Great Britain), which enrolled more than 1,200 students.
- The Management Practices course (New Jersey Institute of Technology), which integrated a Management Game with computer conferencing.
- The Living on Purpose course (Awakening Technology), which used computer conferencing to provide a safe and supportive environment for human relations.
- Role plays, programming courses, and online multiple choice database (NKI Electronic College), which present experiences from Norway.
- Debate, audioconferencing, and online examinations.

The following is an interpretation of these examples, based primarily on descriptive papers. I have, however, met all authors personally and have heard their presentations of the courses, so this article may be influenced by their personalities and enthusiasm, as well.

The International Business Negotiation Simulation Course

The IBNS course, described by Rawson (1990) in "The International Business Negotiation Simulations (IBNS)," was developed jointly by the University of Maryland, University College and the University of Maryland, College Park. The simulations consist of three half-day workshops, each of which uses a computer-managed, text-based, teleconferencing-based simulation to teach business executives how to negotiate successfully in a specific cross-cultural business environment.

The IBNS setting comprises five nodes: 1) the United States company negotiation team, at a U.S. site; 2) the overseas company negotiation team, located in the overseas country specified by the simulation; 3) the U.S. company headquarters; 4) the overseas company headquarters; and 5) the simulation manager.

Timing and stress are often important factors in negotiation. Traditional, asynchronous conferencing can hardly provide a trustworthy simulation of these important negotiation factors. To ensure that these aspects of negotiation are addressed, the IBNS course uses "virtual synchronous" computer conferencing. The information is technically stored and retrieved as in traditional asynchronous conferencing, but the interactivity approaches synchronous conferencing, because the participants are present at scheduled hours and are urged to respond quickly.

Opportunities. Computer conferencing has three important features that are especially valuable for this course. First and foremost, every piece of information entered into the system is stored, so both learners and instructors can review and analyze the negotiation process during and after the negotiations. Second, carefully designed access control allows the four involved groups (two negotiation teams and two headquarters) to hold private conferences. The course instructor may, however, access all conferences, and by such access monitor progress and provide useful instruction. Finally, use of computer conferencing may be less expensive than other international, group-communication alternatives (such as audio- and videoconferencing).

Obstacles. Computer conferencing lacks many nonverbal cues that are valuable in face-to-face negotiation. Visual and auditory clues to the negotiators' emotions and personality are omitted. To overcome this obstacle, IBNS is based on role plays in which each participant's role and personality traits are described in a curriculum vitae. A further obstacle is that computer conferencing printouts lack the distinctive professional character of business correspondence. IBNS will, however, provide learners with start-up handouts furnished with letterheads, logos, etc. to make the course more realistic.

The use of technology may distract the negotiation teams from the core content of the course. For this reason, IBNS provides each team with a trained conferencing system expert to handle the technology. These experts speed up the conferencing process and let the teams concentrate on the course work.

Suggested improvements in the course design. Some cross-cultural differences may be hard to learn without face-to-face experience. Video-conferencing or video tapes may be viable course enhancements for addressing this issue.

The Introduction to Information Technology Course

Mason and Kaye (1989) describe this course as including a print component of seven blocks of material, a course reader, audio and broadcast media, and supplementary materials. In addition, the course required all students and tutors to have an IBM-compatible PC in order to gain practical experience with the social and technological issues discussed in the written material. Further, four software packages—word processing, database management, spreadsheet analysis and communications—were introduced

during the course. Some of the packages were commercial, others were specially developed at the Open University (OU). Altogether, this practical component of the course comprised 20% of the work; the communications element was, therefore, a very small part of the total course work.

Opportunities. The medium provided an opportunity for increased communication between students, tutors, and the course team. Also, the OU design staff was more accessible to tutors and students than in traditional OU courses:

> The primary value of the medium was the opportunity it provided for increased communication: students found it helped overcome the isolation of distance learning and made them feel part of an educational community; tutors were able to give direct feedback to the central staff and to take part in decisions about course presentation; the course team were for the first time in contact with the 'consumers' of their course, expanding on course themes, answering queries and coping directly with criticism and praise from students. (Mason 1990a, 57)

Computer conferencing allowed tutors to co-teach and take turns moderating conferences. Since all comments were stored, the tutors could easily catch up with prior activity.

Obstacles. The cost of telephone charges to students was a major inhibiting factor in increasing the role of computer conferencing in the course. A particular problem was the unequal charges across the country. Establishment of a national network with local dial-in nodes would solve the problem and give students inexpensive and equal access to the OU system.

Technical problems and inexperience in organizing a conferencing system for a large number of students resulted in chaotic system management. Such chaos could have been anticipated; it is difficult to understand how anyone would dare to launch such a huge project without first gaining experience from smaller pilot projects.

Once an OU course is designed, it is hard to alter it significantly. Course evolution based on increased experience with computer conferencing is therefore difficult. Such institutional constraints negate one of the main advantages of computer conferencing in distance education: the opportunity to swiftly adapt the course to current events and information. The OU course design model rules out this opportunity.

Suggested improvement in the course design. OU can be viewed as a bureaucratic organization in which improvements take considerable time to implement. The following suggestions may have been considered; if so, they have yet to be implemented.

Computer conferencing was not the primary communication medium in this course. Most of the assignments were submitted by land mail. A much better solution would be to let students submit all assignments via the conferencing system. Computer conferencing was a minor part of this course. Only ten of 400—far too few—study hours were apportioned to computer conferencing (Mason 1990a, 57). Computer conferencing should be integrated as a major part of several related courses.

Robin Mason mentions that the course team is working on a number of "value added" services, such as optional group discussion assignments and making previous years' work available online (Mason 1990b). It is surprising to hear these options mentioned as "value added" service, because they should be

included in the basic services provided in computer conferencing courses. Value added services in distance education computer conferencing should include online libraries, documentation centers, multiple choice databases, computer aided instruction, accounting systems, grading systems, logistics systems, etc.

The Management Practices Course

This course, as described by Hsu (1990), integrated a Business Simulation Game with computer conferencing in a Management Practices course. Students were divided into six groups of four. Each group represented a company, and each student was assigned a role as Chief Executive Officer (CEO), Financial Officer, Operations Chief, or Marketing Executive. These companies competed against each other in a Business Simulation Game through three phases of the companies' life cycles: start-up, growth, and independence. The game simulated nine years during a nine week period. Each year, the students "employed" in each company established crucial input data such as price, advertising, purchase, production, size of sales force, etc. The data were submitted to the instructor, who compiled the information and executed the game. This process resulted in a set of output data for each company, consisting of units sold, back orders, market share, operating income, income tax, net income, etc. The companies were evaluated based on the final results after nine years.

Each company was assigned a private conference in which the employees could discuss the simulation input and output data. In another conference, called Managers' Corner, the students could participate in management-related discussions.

Opportunities. The conferencing system allowed the instructor to monitor the decision-making processes in each company and to give appropriate feedback to the students. Further, the students had a unique opportunity to review arguments from previous "years" and to check them against the actual outcome of the simulation. The output data from the simulations were available to all students immediately after the instructor uploaded them.

Obstacles. The problem of decision making is not discussed in the article. Experience shows, however, that asynchronous decision making in groups is extremely difficult. A synchronous medium, such as telephone or face-to-face meeting, is suggested when decision making is crucial.

Suggested improvements in the course design. Hsu's own suggestion (personal communication, 1990) that the employees evaluate the performance of their colleagues in the roles of CEO, Financial Officer, etc. represents a valuable improvement to the course.

The Living on Purpose Course

Peter and Trudy Johnson-Lenz have based their workshops on the philosophy that "Computer-mediated meetings are potential islands of safety, but safety is created by people, not technology. It occurs when people take the risk to express themselves, trust, and respect each other. However, while technology

cannot create safety, it can support it. Groupware can join human potential and supportive technology into a creative whole." (Johnson-Lenz 1990, 304)

The Living on Purpose course was described in the May 1990 Summer Program of the Awaken Virtual Learning Community as a month-long workshop offered as a collaboration between Chinook Learning Center and Living on Purpose. The workshop included self-discovery exercises and group sharing. Living on Purpose meant discovering what really mattered to the individuals and helping them find the courage to live it.

Opportunities. The participants

> ... sign a covenant with each other to 'create a safe, supportive, and vital learning community together.' We agree to keep each other's items confidential, participate regularly, and inform our group when we are absent for whatever reason. We also agree to accept and be patient with the parts of ourselves and others that are not yet clear, to listen with care and compassion to each other, to speak our truth as well as we can, and to remember and acknowledge everyone's personal wholeness and connection to the Mystery. (Johnson-Lenz 1990, 312)

The participants must answer—in the conferencing system—questions such as "What is important in your life?" and "What do you think of yourself?" Participants must scrutinize their lifestyles to formulate answers to share—in writing—with the group. Many people will find it less frightening to share their inner feelings and thoughts via computer conferencing than to do so face to face. In this way, technology may facilitate valuable human interaction between people who feel comfortable with the medium.

Peter and Trudy Johnson-Lenz have designed (and trademarked) a Virtual Circle that they claim is useful in some settings. "A talking stick" that represents permission to speak is passed around a circle. Each person speaks his or her truth in turn while everyone else listens with respect. The Virtual Circle concept encourages everyone to express opinions and avoid reticence.

Obstacles. Many people may perceive the technology in this course to be ill-placed. In *Megatrends* for instance, Naisbitt (1984, 51) discussed the conflict between high tech–high touch: "The more technology around us, the more the need for human touch." In Naisbitt's description, these are opposite qualities. Peter and Trudy Johnson-Lenz will, though, use high tech (computer conferencing) to facilitate high touch (quality human relationships). Each approach appeals to separate groups of people, so courses like "Living on Purpose" probably will attract many and varied participants in the future.

Suggested improvements in the course design. Input from psychologists on this course, and their participation in course design and instruction, would be valuable.

Other Innovative Computer Conferencing Courses

The following courses are, so far, not well documented in English. The intention is not to present a complete review of these courses. However, a brief overview may provide some useful ideas for future courses.

Role plays, programming courses, and online multiple choice databases. The following examples from

the NKI Electronic College in Norway are described in Paulsen (1989), Paulsen and Rekkedal (1990), and Paulsen and Søby (1990). In the fall of 1988, Monica Johanessen taught an Information Systems course via the EKKO conferencing system. In a conference, she presented a case and assigned each student a role. The case described a company planning to invest in a new computer-based office automation system. The students were assigned roles as user, accounting officer, project manager, labor union representative, etc. Over a period of about fourteen days the students were expected to elucidate the different facets of this project, as reflected through the different roles.

Ragnar Børsum has taught programming courses every semester since the fall of 1988. In the Pascal course, the students programmed in Turbo Pascal on their home microcomputer. The program source code was posted to the instructor or shared with the other students in the conferencing system. In this way the teacher and the students could download the programs, change them if they desired, and execute them on their local computers. In the Cobol course, he experimented with letting the students access the host computer's Cobol compiler. This was bothersome, but it worked. The important lesson was, however, that distant students can access host computer applications such as compilers, database systems, statistics software, etc.

Henny Lindland used the EKKO online multiple choice database as a part of the Introduction to Computer Science course for the first time in Fall Semester 1989. The students could download multiple choice questions, figure out the answers, and then upload their answers for scoring by the database.

Debate. Clark (1992) organized an electronic debate about war protestors and freedom of speech in February 1991 as a part of the "What's in the News Telecomputing Project." The debate centered on a proposition which set forth the discussion issue. The affirmative side supported the proposition; the negative side challenged the affirmative. The object of the activity was to see which of the teams best presented the case. Before the debate, neither team knew which position it would be assigned, so each had to learn as much as it could about both points of view. The *Electronic Debate Handbook*, included in the course material, presented rules and a schedule.

International audio and computer teleconferencing. Professor Michael G. Moore taught "International and Comparative Adult Education" at The Pennsylvania State University in Spring Semester 1991. Students in four cities in Pennsylvania communicated with guest experts in seven telephone conferences. The guest experts participated from England, Eastern Germany, Finland, Canada, China, India, and Spain. Some guest experts were willing to communicate with the students via Internet to follow up the telephone conference. The computer communication was an optional experiment and not an integral part of the course. However, the combination of telephone conferencing and computer conferencing is an innovative way to communicate with international guest experts in a course.

Online examination. External examiners, faculty, and, perhaps, co-students could participate in a two- to three-day online challenge examination period. The students could prepare a hard copy or upload the examination paper to their challengers some time before the online examination starts. During the examination period, the challengers could be expected to post questions about the examination paper which

the students must answer in a plenary conference. The advantage of this compared with a traditional oral examination is that both questioners and respondents have more time to consider their answers than in a hectic, one-hour face-to-face examination. The online examination is, of course, much more interactive than is a traditional written examination.

Conclusion

This paper illustrates some ideas of computer conferencing's potential in future distance education pedagogy and course design. There are three core features in computer conferencing that are used successfully in all courses. First, interactive group communication is used as a means to create collaborative learning. As we have seen, this is made possible through negotiation teams, co-teaching, role play, and islands of safety. This list can be extended with project work, study circles, seminars, and workshops. The opportunities for collaborative learning are abundant. Second, conferences are divided into separate user groups, giving instructors an opportunity to monitor and provide instructions to each group. In this way, educators can set up competing teams, as in the business simulation game and the negotiation course. Third, all communication can be recorded and reviewed, allowing students to participate independent of time, to check information presented earlier in a course, and to review the learning process. In this way, for example, the negotiators can scrutinize their negotiation process and the employees can analyze their priorities in the business simulation game.

Despite the development of several encouraging examples of innovative computer conferencing courses, course design and pedagogy is still an underdeveloped field. My modest hope is that this paper will trigger some innovative design for future distance education courses.

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Computer-Mediated Communication and Distance Education Around the World

An Annotated Bibliography

Introduction

This annotated bibliography describes experiences in distance education and computer-mediated communication from around the world. A bibliography of articles from different parts of the world was compiled to illustrate a variety of CMC approaches. The search for the articles resulted in many from North America, quite a few from Europe and Australia, but relatively few articles from the rest of the world. For more information about European projects, the reader may consult:

Mason, R. 1989. *The Use of Computer Networks for Education and Training: Report to the Training Agency.* Milton Keynes: The Open University.

Australia

Harry, K. and A. Castro. 1988. Electronic information exchange: The dream and the reality. In *Developing Distance Education,* eds. D. Sewart and J. S. Daniel, 238–41. Papers submitted to the 14th World Conference in Oslo, August 9–16. Oslo: ICDE.

This chapter briefly describes the development of both the Australian Open Learning Information Network (AOLIN) and of an informal bibliographic database working group since the Thirteenth World Conference of the International Council for Distance Education in 1985. It also identifies international initiatives which have made recommendations during the same period regarding information and documentation on distance education. Finally, it outlines the characteristics of an ideal electronic network linking distance education practitioners, indicates what is actually possible in terms of one-to-one and one-to-many communication, and identifies current problems. (The ICDL Database accession #10000803)

Monro, D. 1987. Quality distance education = computer based feedback + electronic mail. In *Using Computers Intelligently in Tertiary Education,* eds. J. Barrett and J. Hedberg, 147–52. A collection of papers presented to the Australian Society for Computers in Learning, November 29–December 3. Kensington, NSW: ASCILITE.

The Riverina-Murray Institute of Higher Education offers a post-graduate Diploma in Computer Applications. The course is offered only externally and utilizes AUSTPAC as the primary instructional and communication medium. The paper describes the types of facilities that have been investigated and developed in an attempt to provide an enhanced learning environment for the external student. Two of the facilities discussed are the use of electronic mail and computer-based feedback. The use of electronic mail has meant that the external student can have the same types of regular communication with lecturers that an on-campus student takes for granted. Computer-based feedback has provided a periodic assessment mechanism, controlled by the student, that highlights areas of learning difficulty

by directing the student to material in the prescribed texts and notes. The combination of these facilities has proved highly effective. Not only has the marking load on staff resources dropped, but students are able to ask questions relating to their particular difficulties and receive direct advice on overcoming those problems. (Author's abstract) (The ICDL Database, accession #10000619)

Canada

McCreary, E. 1989. Computer-mediated communication and organisational culture. In *Mindweave: Communication, Computers and Distance Education*, eds. R. Mason and A. Kaye, 101–12. Oxford: Pergamon Press.

After describing the impact computer conferencing has had on the University of Guelph's organizational culture, the author concludes:

> After five years of exposure to the medium we do not feel we have mastered it, or even fully harnessed it. It continues to surprise us. In a non-directive way CMC is giving us a stimulating new experience of ourselves as an organisation. Its impact on overall organisational vitality has been positive but not unequivocal. . . . [T]he only way human beings can individually or collectively be 'more vital or alive' than 'just alive' is to be more conscious, and for better or worse CMC has made us that. (p. 112)

China

Gao, F., W. Li, and D. Li. 1989. A PC-based audio/graphics/video image satellite communication education system and its applications. *Educational & Training Technology International* 26(3):248–53.

This paper describes a PC-based communication system equipped with audio, graphics, and video devices for enhanced versatility. On a single telephone line, the system allows transfer of graphics and still video along with ordinary voice. Both teacher and students can use an electronic pen and a tablet to transmit handwriting and drawing in real time. An image-capture facility allows users to capture computer graphics and still pictures from sources such as camcorders, videotapes, and monitors.

In March 1988, over 300 people in seven United States cities and Beijing took part in the first international teleconference using this system. Since then, the system has been used to provide students in Beijing with lectures from the U.S.A. about cell biology, expert systems, and features of American college teaching. The system is a versatile and inexpensive new tool for teleteaching.

Denmark

Bang, J., and M. Møller. 1990. Computer conferencing in Danish distance education. In *Media and Technology in European Distance Education*, ed. A. W. Bates, 249–52. Milton Keynes: Open University for the EADTU.

This article describes the use of PortaCOM, a Swedish computer conferencing system, for distance education at the Jutland Open University (JOU) in Denmark. The authors present preliminary experiences gathered from three Arts Foundation courses, one Archaeology course, and one Mass Communication course, all delivered in 1988 and 1989.

JOU practices a group-oriented concept by which students are organized in classes of 20–35 students. The groups meet in face-to-face seminars five or six times a year. Between the seminars, the students use PortaCOM as a course supplement.

In some of the courses, students had the necessary communication equipment at home; in other courses, students had to use the equipment at one of JOU's five study centers.

> The students with the home based personal computers have found that computer conferencing has facilitated communication with their teachers and fellow students. These students completed the arts foundation course with better grades than on similar courses where computer conferencing had not been used. . . . The conferencing system has been a very useful addition to their distance education. . . . It has been hard to motivate students without home-based personal computers to use computer conferencing. They seem unwilling to leave their homes and go to a study center for communication, when they could just as easily grab the phone or mail a letter. (pp. 250–251)

Christensen, B. B. 1990. Teachers and CMC at Jutland Open University: A case study. In *Media and Technology in European Distance Education*, ed. A. W. Bates, 253–58. Milton Keynes: Open University for the EADTU.

This article concentrates on the teachers' role in the Arts Foundation courses at Jutland Open University (JOU). Five teachers were engaged in the three courses conducted in 1988 and 1989. Only one had a degree from a university at which computers were a part of the curriculum; the others had no computing skills. Their expectations about CMC ranged from sympathetic to very negative.

Christensen points out that experiences from just five teachers are too limited to draw any firm conclusions; however, she tentatively concludes that

> CMC gives more work to the teachers, but extra teaching hours have not been added to the courses. . . . [T]he teachers have to be trained in the technical and especially the educational use of CMC. . . . [And the] experiences of teachers in previous years must be passed on to new teachers. . . . I am more and more convinced that many of the problems we are observing are not primarily due to CMC, but in part due to the implementation of it and in part to the way that distance education is organized. It is not CMC that causes the problems, but we become aware of the problems because of CMC. CMC can be an important tool in solving these problems. (pp. 257–58)

Finland

Manninen, J. 1991. Computer conferencing and self-directed learning–Experiences from computer-mediated facilitating. Paper presented at the Fifth International Symposium on Adult Self-Directed Learning at the University of Oklahoma-Norman, February 24–26, Norman, Oklahoma.

The paper is based on studies of two one-month courses in Finland. The first course, Philosophy of Adult Education, was held at the Helsinki University in the spring of 1990. The students did their course-work by participating in discussion groups in PortaCOM. Twelve students, aged 20 to 35, who all had basic computer skills, took part in the course. Face-to-face meetings were arranged to train them in using PortaCOM. All students had daily access to a computer either at home, at work, or on campus. The average student logged on to PortaCOM thirty-nine times, spent fifty-nine hours online, and sent twenty-nine messages. Some group discussion took place.

The second course–Introduction to Adult Education–was offered in the fall of 1990. Thirty students at the Open University, University of Helsinki, used Tradepost (Telebox) for communication. The students, aged 35 to 50, were trade union members from the metal industry and the child care field. All had access to a computer at home, at work, or at a trade union center. All of them had completed a theory course about computer conferencing, so no face-to-face training was provided. The average student logged on just a few times and was online about 2.3 hours. No discussion took place, and in several local groups the system was handled by one person who took care of the mail for his or her peers.

The paper concludes that students must have daily access to computers, must be trained to use the equipment, and must use the system on their own.

France

Guihot, P. 1989. Using Teletel for learning. In *Mindweave: Communication, Computers and Distance Education*, eds. R. Mason and A. Kaye, 192–95. Oxford: Pergamon Press.

The article describes the use of the French videotex system Teletel (also known as Minitel) for education. Beginning in 1986, widespread access to Teletel terminals resulted in several activities:

- For a per-hour fee, educational services on Teletel provide answers to homework questions via e-mail and databases with model answers to questions asked in national examinations.
- Teletel equipment has been distributed to French schools.
- Teletel has been used in university applications such as initial registration of students in the universities in Paris; information services to prospective and current students; and teaching at the University of Paris-Dauphine.
- The Ministry of Education has established the EDUTEL information service for parents and teachers.

Indonesia

Brochet, G. and E. K. McCreary. 1990. Telecommunication across continents: Indonesian/Canadian cooperation on the Sulawesi Regional Development Project. In *Proceedings of The Third Guelph Symposium on Computer Mediated Communication*, 350–60. Guelph, Ontario: University of Guelph.

International development projects require advanced communication tools. Time differences can be a problem, telephone calls can take hours to place, and Telex may be inconvenient. This paper describes the use of the CoSy computer conferencing system by project staff to facilitate communication between sites in Canada and Indonesia. Since 1984, the system has provided daily e-mail and CMC contact between staff members on either side of the world. PT IndoSat, the Indonesian telecommunication provider, established satellite links for the project. The paper concludes:

> [The project] . . . repeatedly confirmed the significant advantages of CMC over more traditional forms of management communication. The speed, degree of detail, technical reliability, relative confidentiality, relative candour and immediate, permanent documentation afforded by CMC communication, surpass the alternatives and have established this medium as indispensable to this type of project. The Sulawesi experience holds significant promise for any rural development project involving comparably complex work in remote sites.

Latin America

Thorngate, W. and B. Klejner. 1990. Developing countries and communications: A Latin American example. In *Proceedings of The Third Guelph Symposium on Computer Mediated Communication*, 395–403. Guelph, Ontario: University of Guelph.

From June 1987 to December 1989, about fifteen medical scientists in Latin America and Canada used EIES and Bitnet for communications. EIES was accessed via the host computer at New Jersey Institute of Technology, U.S.A., and Bitnet was accessed via the host computer at Carleton University in Ottawa, Canada. Most of the scientists used e-mail frequently, but they used computer conferencing

very little. The problems with technical equipment and local telephone connections were chronic. Most participants could not maintain a telephone connection for more than about fifteen minutes at a time. The telecommunication infrastructure in Latin America is a major obstacle for projects such as this one.

The Netherlands

Meurs, C. E. J. van, and P. A. J. Bouhuijs. 1989. Tele-education: An experiment on home computing at the Dutch Open University. *Open Learning* 4(1):33–36.

The article describes a nine-month project conducted by the Dutch Open University. In 1987, 668 students enrolled in "Systems and Systems Controls." Of these, sixty volunteer students and two tutors took part in the Tele-education experiment. These students were supplied with a PC, a printer, and a modem. Both hardware and communication software were provided free of charge. The course used three media: print, computer-aided learning, and computer-mediated communication.The computer-aided learning components comprised an introduction to the computer, a distribution system game, self-assessment questions, tutorials, and simulations. The computer-mediated communication system consisted of e-mail, a bulletin board system, and a system for file transfer.

The authors state that the results of this project were rather disappointing in that no educational advantages of a Tele-education approach over a standard distance education course could be detected. With regard to freedom of time and place, the Tele-education course was rated significantly lower than the original course. The overall judgement of the computer-aided learning course, however, was positive. The authors also note that the benefits of computer communications may be fewer in the Netherlands than elsewhere, because the country is densely populated and has no remote areas.

New Zealand

Sheffield, J. and R. J. McQueen. 1990. Groupware and management education: Matching communication medium to task requirements. In *Proceedings of The Third Guelph Symposium on Computer Mediated Communication*, 181–92. Guelph, Ontario: University of Guelph.

The University of Auckland has developed a groupware system to support synchronous group sessions. This paper reports the experiences from a management course exercise using the groupware. Two groups of ten students each took part in an assignment using the Nominal Group Technique. One of the groups used the groupware, the other group used traditional tools such as wall-mounted sheets of paper and felt markers.

Both groups were satisfied with "the technical and the socio-emotional aspect of the discussion." The students who used the groupware completed the assignment in less time than the other students and, as a result of the groupware process, they developed a written assignment report.

Norway

Rekkedal, T. 1990. Recruitment and study barriers in The Electronic College. In *The Electronic College: Selected Articles From the EKKO Project*, eds. M. F. Paulsen and T. Rekkedal, 79–105. Oslo: NKI Forlaget.

The article describes results from in-depth telephone interviews of twenty prospective computer conferencing students, twenty-six correspondence students, and twenty computer conferencing students, all in connection with NKI's ten-course Information Processing Program. The interview

period was June 1–June 20, 1989, and the respondents were those the interviewer was able to reach via telephone during this period. The conclusions from the interview are:

- The Information Processing Program can be studied in four ways: Full-time and part-time on campus studies, through correspondence studies, and via computer conferencing. Different alternatives serve the needs of different target groups. Correspondence and computer conferencing seem to appeal to different student groups, who deliberately choose the method they prefer.
- Distance education through computer conferencing has functioned quite well.
- There is a need to improve the dissemination of information about technology and the cost of courses taught via computer conferencing to prospective students.
- A lack of modems and limited knowledge about the technology is a major recruitment barrier.
- Research is needed to develop better methods for teaching via computer conferencing.

Søby, M. 1990. The postmodern condition and distance education–Computer conferencing and communicative competence. In *Proceedings of the Third Symposium on Computer Mediated Communication*, 112–20. Guelph, Ontario: University of Guelph.

The article discusses the new opportunities computer conferencing offers distance education, and describes the NKS College experience with the PortaCOM conferencing system in the fall of 1989 and the spring of 1990. PortaCOM was initially offered as one compulsory part of "The Computer as a Tool" in the NKS Business Administration Program. Subsequent student pressure resulted in the offering of conferences for two additional courses: Statistics and Economics. PortaCOM was used as an adjunct to correspondence tuition, telephone contact, and face-to-face contact. In the 1989 spring term, about 100 students logged on to PortaCOM an average of 17.5 hours each. About thirty students were very active, thirty were somewhat active, and the rest were "lurkers." Interviews with the students led the authors to conclude that "CMC supported their study activity and responsibility towards their own education and supported the co-operation among the students." In Spring Semester 1990, the NKS College established additional conferences on PortaCOM: three for "PC as a Tool," two for "Economics," two for "Organizational Behaviour," one for "Management," one for "Administration," and the Cafe Online. Of the 600 enrolled students, 300 actively used PortaCOM.

U.S.A.

Coombs, N. 1989. Using CMC to overcome physical disabilities. In *Mindweave: Communication, Computers and Distance Education*, eds. R. Mason and A. Kaye, 180–85. Oxford: Pergamon Press.

This article describes the experiences from two CMC courses that the author, who is blind, taught at the Rochester Institute of Technology. The courses, dealing with topics in modern American history, made use of a textbook; the television series "America: The Second Century"; and computer conferencing via VaxNotes. The first course enrolled thirteen students. The teacher conducted face-to-face classes and moderated the computer conference with the help of a personal computer equipped with a speech synthesizer. Students "evaluated all aspects of the computer more favourably than they did either the videos or the text. They rated the conference discussion very positively." One student was hearing-impaired.

The second course was further developed for hearing-impaired students, using captioned video as well as computer conferencing. Coombs states: "The handicapped, once having learned the basic technologies, can participate equally with their disability being invisible."

Phillips, G. M., G. M. Santoro, and S. A. Kuehn. 1988. The use of computer-mediated communication in training students in group problem-solving and decision-making techniques. *The American Journal of Distance Education* 2(1):38–51.

This article describes the use of computer-mediated communication in a small group performance course. Instruction in such courses is often ineffective because of instructors' inability to effectively monitor group discussion. Using a computer network has three benefits: 1) instructors can closely monitor progress in the groups; 2) students receive detailed feedback about their performance of communication skills in their groups; and 3) the instructional staff can increase their monitoring efficiency to effectively advise more groups than in non-computerized group performance courses. The details of the evaluation, feedback, and computer system are explained.

PART THREE

GO MEEC!
A Goal-Oriented Method for the Establishment of an Electronic College

Introduction

An Electronic College is a computer conferencing-based system of people, routines, and utilities that can assume all the responsibilities of a college. It facilitates written communication among students, faculty, and staff, independent of time and space. The concept is further described in *The Electronic College* (Paulsen and Rekkedal 1990) as an example of a "virtual school." The word "virtual" means essentially real, although perhaps not recognized as such. A virtual school

> ...will thus not exist as a physical building containing classrooms, offices, teachers, staff, and students. Nevertheless, it may be thought of as real, since it can assume all the responsibilities of an ordinary (physical) school.
>
> Most tasks will be handled by people, as in a physical school. Many of these tasks involve interpersonal communication. A virtual school should therefore possess a maximum of facilities for this. Ideally, such communication should be free of limitation with respect to time and place.
>
> A virtual school may be regarded as an information system, that is, a system for generating information. This entails the gathering, processing, storing, transmitting, and presenting of information. These activities may be performed manually by people or automatically by computers. (Paulsen 1987, 72)

Development of an Electronic College

This article focuses on the development of electronic colleges. However, the method described is appropriate for the establishment of a wide array of educational CMC systems such as ad hoc courses, research networks, and electronic communities.

In describing the Virginia Teacher-LINK project, Bull et al. (1992) identify two components necessary for the development of an electronic community. Loosely divided into the categories of equipment and people, these elements may be described in broader terms as the infrastructure of hardware and software, and the underlying culture of the user community. The infrastructure consists of microcomputers, modems, phone lines, and mail programs. The underlying, equally critical electronic culture uses computer networks to communicate as casually and competently as with the telephone. The second component requires not only initial training in use of the network, but also modeling of possible applications and uses.

Switzer (1992, 219–27) proposes eleven suggestions for the implementation of CMC in education:

- Develop a vision,
- Focus on a theme,
- Attack real educational problems,

- Design structured solutions,
- Take a system perspective,
- Expect uneven progress and tolerate ambiguity,
- Use time to your advantage,
- Keep it simple,
- Put someone in charge,
- Make technology work for you in multiple ways, and
- Let synergism develop.

Choosing from Switzer's suggestions and expanding on Bull et al. (1992), this paper is organized around the Milestone Plan (Figure 1), a systems development approach based on an instrument that is described in *Goal Directed Project Management* (Andersen, Grude, and Haug 1987). In addition, the paper expands on the framework presented in "The Seven Entities of Computer Conferencing Systems" (Paulsen 1990). These models imply that the establishment of an electronic college involves working with both people and technology. Commitment to training, support, and motivation of people, as well as to technological progress, is vital. For this reason, the Milestone Plan has two result paths: one path dealing with people, the other with technology.

Establishment of an electronic college depends on a project group with project management skills, personnel management skills, and technical skills. The project will require a work force, technical equipment, and money—and will take months to accomplish. The sequence of the milestones is carefully chosen, but some milestones may be interchanged. The rest of this paper describes the milestones in detail.

Define the Aim

Defining the aim is extremely important for two reasons. First, the project group and management need to agree upon common goals. Without a joint perception of the project aim, the project cannot succeed. Second, the project group needs a clear and understandable aim for internal justification and external marketing. In this process, it is useful to devise an attention-catching project name by which people easily identify the project.

Procure Management Support

Management support is crucial for the project. In addition to approving the project aim, management must allocate the necessary resources and signal a willingness to support the project to all participants. The project has very little chance of succeeding unless support comes from the highest level of management.

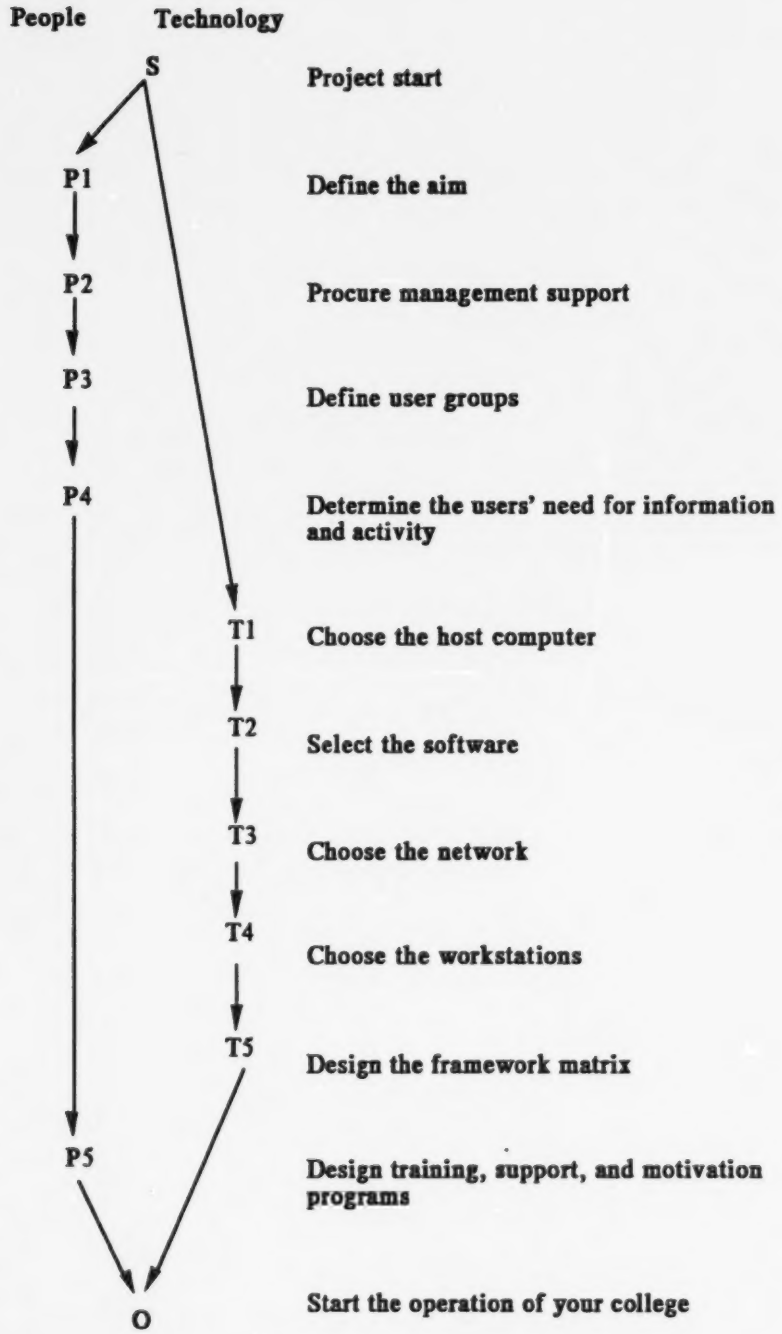

Figure 1. Milestone Plan for the Establishment of an Electronic College.
S = start P = people T = technology O = operation

Managers constantly send important verbal and nonverbal messages to lower levels about what is and is not important. Thus, for the project to succeed, management must make it clear through written communication, as well as through verbal and nonverbal communication, that the project is one of high

priority. Signals of support should be discussed with managers. It is seldom enough for managers to support the project in words and print; they must show their support by actually using the system. Frequent use of the system displays the ultimate signal of support to others in the organization, and thus works to insure the overall success of the project.

Define User Groups

The main reason for establishing an electronic college is to provide users with educational services. Designing a successful system is dependent on comprehensive identification of the system's users. Potential users should be clustered in user groups, some of which are considered as target groups: those users whom the institution wants to provide with services or information. Users to be considered include the system operator, hackers, prospective students, present students, passive students, former students, teachers, guest experts, teaching assistants, former teachers, facilitators, the bursar, etc. It will be necessary to add to, omit, and cluster this list of potential users.

Determine the Users' Need for Information and Activity

It is useful, but sometimes difficult, to distinguish between information and activity in a conferencing system. In this context, information should be viewed as static, such as important facts that the college wishes to distribute to its users. Information is well suited for "broadcasting" via bulletin boards. Activities, however, are characterized by dynamic group interaction, which is best accommodated in conferences.

Decisions regarding which user groups will be served must be followed by decisions about what kind of information and activity each user group needs. The need for information can be determined through interviews, observations, or carefully designed instruments. Another consideration is whether some of the necessary information can be imported from other networks. Such questions need to be repeated frequently, possibly each term. Further, it is necessary to decide how long the information should be available before it is discarded. Information to consider would include

- General information about the electronic college,
- Information about the programs offered,
- Syllabi,
- User manuals,
- Schedule of classes,
- Student, faculty, and staff rosters,
- Examinations,
- Fees, and
- Electronic journals imported from external networks.

Interactive activities possible via CMC include

- Social conversation,
- System support,
- Counseling of prospective students,
- Teaching,
- Pedagogical discussions, and
- Relevant discussions imported from external networks.

Choose the Host Computer

The host computer—the nucleus of the system—can be a tiny PC or a huge mainframe. Decisions about what kind of host to use should be based on capacity. It is necessary to estimate the number of simultaneous and accumulated users the college will be serving. Another question to consider is whether to utilize computer equipment already installed for other purposes or to invest in new hardware. The smaller initial cost of using a host computer already installed should be weighed against the potential security problems of possible student access to other host computer applications.

Choosing a host computer means choosing an operating system as well. Non-proprietary systems, such as Unix and MS-DOS, provide a variety of existing and future software solutions. Vendor-specific operating systems usually have few, if any, suitable software solutions. An electronic college also will need several utility programs and management information systems in addition to the conferencing system. These factors argue for choosing standard, instead of vendor-specific, operating systems.

A reasonable solution for many colleges is to lease host computer access from a commercial computer service bureau. This solution entails a low initial cost and a short implementation period. Another benefit could be access to an existing base of experienced users. On the other hand, leasing access to a host computer tends to make the electronic college overly dependent on the service bureau. The college may have difficulties in building a suitable framework, as described in this article. There are also many examples of colleges complaining about the charges they have to pay for using the conferencing system.

An electronic college should be in continual operation, even late at night, on weekends, and during vacations. This policy could be a challenge for many small colleges. Larger colleges, on the other hand, could consider software solutions that allow the system to be distributed among several host computers. Such distribution might be especially appropriate for colleges located at several sites.

Select the Software

People often think that the software is the most important part of a conferencing system. This article warns against that notion. The users, the activities, and the information are far more important. Do not overestimate the importance of the software; look for a reasonable solution that is easy to implement.

Institutions can choose from among several software strategies. The most obvious possibilities are to buy standard software, to adapt some applications available on the institution's host computer, or to customize an application. The appropriateness of any solution is often dependent on what is available for a specific institution's host computer.

Choose the Network

Some important issues to consider when forming the communication networks are user friendliness, cost, baud rate, capacity, and versatility. Most public networks are not user friendly; they either intimidate or confuse users. This is a major obstacle for prospective students. Unless we can lower this comfort threshold for prospective users, electronic colleges will never become a success among ordinary people.

Communication cost should be divided equally among the students. This is possible by using "green" (toll-free 800) telephone and PDN (Packet Data Network) numbers paid for by the college. The college can implement different strategies for reducing communication costs, depending on the chosen conferencing software and framework. The communication network structure will obviously influence the costs as well.

The capacity of a conferencing system can be measured by the maximum number of coherent users. This number is equivalent to the number of communication ports installed. One communication port can support only one user at a time. Since use is spread over a period of time, however, one port is usually adequate for twenty to one hundred users.

The communication network of an electronic college should be versatile. Both local and wide-area networks should be supported, as should public telephone and PDN networks. Additionally, the college should support the most common baud rates used by prospective students. Today, these range from 300-19200 bits per second (BPS).

Choose the Workstations

A workstation should consist of a microcomputer, a modem, and a local printer. It is necessary to have local word processing and communication software. The extent to which the workstation hardware and software should be standardized for ease of access is a widely debated issue. Standard equipment allows for the possibility of making sophisticated, user-friendly interfaces, pre-programmed macros, etc. User manuals can be tailor-made and do not have to support lots of different equipment. Student support via telephone hotlines and within the conferencing system is easy to implement and will insure that fewer prospective students will be excluded due to technological obstacles. On the other hand, standardized equipment supported by a few software and hardware vendors will exclude users who have workstations with other configurations.

The college could offer inexpensive or free software to system users. This policy leads to several problems, however. First, it increases the administrative workload. Second, the college must provide

support for any software it develops. Finally, such software must be frequently updated and then issued and supported in its updated form.

The workstation should be able to execute local utility programs useful in an electronic college. Some examples include software for computer-aided instruction, compilers for programming courses, and spelling and grammar checkers for language courses.

Design the Framework Matrix

After deciding which user groups to serve and what kind of information and activity will be provided, the Framework Matrix can be established (see Table 2 on page seven for an example of a framework matrix). The user groups are placed along the horizontal axis and the information and activity structure along the vertical axis. A determination must be made for each cell in the matrix as to the extent of access for each user group to the corresponding information. User privileges are designated "no access," "read only access," and "read and write access." Often, more subtle access delineations such as "censored" and "mandatory access" are useful.

Design Training, Support, and Motivation Programs

Even excellent technical systems are useless without users. Often, the hardest part of the project is to help and motivate people to use new and unfamiliar technology. Each user group's need for training must be assessed and, if necessary, separate training programs must be developed. Establishment of a team of facilitators to provide user support is recommended. This team could be responsible for producing user manuals, answering a telephone hotline, providing online help, and conducting on-site demonstrations.

With proper motivation, people are generally willing to struggle considerably to overcome technical obstacles. Without motivation, they tend to reject any learning effort. The ultimate motivation for people comes from managers who model frequent system use. For this reason, managers should receive early training and encouragement in system use.

Conclusion

Until now, only a few electronic colleges have been established. Interest in these institutions is increasing, however. It is hoped that the method described here can be helpful for the establishment of future electronic colleges. While not presented as a foolproof method for success, it can provide guidelines to help others avoid some obvious pitfalls during the development process.

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The Electronic University:
Computer Conferencing in Mass Education

Introduction

To date, courses taught via computer conferencing have enrolled relatively few students. Many courses have less than ten students, few more than fifty. Consequently, experts question whether computer conferencing is suitable for mass education (Mason and Kaye 1990). We know, however, that computer conferencing systems can handle thousands of users. CompuServe claims in recent advertisements to have 800,000 users. Hence, computer conferencing systems can evolve technically into electronic universities capable of handling more students than can be served by large traditional universities. System designers and programmers continually add new features to existing applications, and business managers seek to attract more customers to their services. This expansion could include the evolution of small electronic colleges into large electronic universities. The crucial question is, however: What would be the benefits of such an evolution?

Some important benefits are the opportunities to increase efficiency by large scale operations, to coordinate research and development, and to bring university people together in a creative setting. Currently, we see too many scattered, fumbling experiments trying to reinvent the wheel of computer conferencing.

This paper will present some carefully chosen, educationally and/or technologically interesting organizations and characterize their key attributes, and it will focus on the opportunities and problems that arise when an electronic university enrolls thousands of students. The intention is not to give a critical analysis of these organizations, but to identify features that can assist in building models for future electronic universities. It will be argued that an electronic university is a system

- Serving thousands of users, as does CompuServe;
- Offering courses and programs from several colleges, as does Electronic University Network (EUN);
- Enrolling hundreds of students in a single course, such as the British Open University course DT200;
- Mastering distance education logistics as does The Spanish National University for Distance Education (UNED); and
- Having an organizational structure similar to that of The Pennsylvania State University (PSU).

CompuServe, EUN, DT200, UNED, and PSU are discussed as providing examples of these system characteristics. The possible contribution of each to the development of electronic universities is also suggested.

CompuServe

CompuServe is a commercial, general-purpose computer conferencing system that claims to have 800,000 users. It is a truly international system although the communication language is, beyond doubt, English. Group communication in CompuServe is conducted in a variety of forums, all accessible from a hierarchical menu structure. When one issues the CompuServe command "GO FORUMS," the Forum Menu (Figure 1) appears.

Via each menu option, users may access numerous special-interest Forums. Since the users choose the Forums they want to join, they need to communicate with only a limited number of users. In some of the smaller Forums, one might feel lonely, even though CompuServe has a total of 800,000 users.

Via CompuServe one can access reference libraries such as ERIC and Dissertation Abstracts, buy mail-order computer equipment, and consult a travel agent. These are the kinds of services traditionally available to on-campus students. In addition, several courses have been taught via CompuServe (Conroy 1991). By issuing the command "GO EDUCATION," one has access to the Education Menu (Figure 2).

FORUM MENU

1. Aviation Forums
2. Education Forums
3. Science/Technology
4. Entertainment/Games Forums
5. Financial Forums
6. Hardware Forums
7. Media/Electronic Publishing
8. Home/Health/Family Forums
9. Professional Forums
10. Software forums
11. Sports Forum
12. Travel Forums

Figure 1. Forum Menu

EDUCATION MENU

1. Academic American Encyclopedia
2. Computer Training Forum
3. Dissertation Abstracts
4. Education Forum
5. Education Research Forum
6. ERIC-Education Research
7. Foreign Language Forum
8. IBM/Special Needs Forum
9. IQuest Education Info Center
10. LOGO Forum
11. Magazine Database Plus
12. Peterson's College Database
13. Science/Math Education Forum
14. Student Forum

Figure 2. Educational Menu

The CompuServe Legacy to Electronic Universities. First, the success of the CompuServe system proves that it is possible to serve thousands of students in a computer conferencing system. Second, it shows how special interest groups can be organized to deal with so many users. Third, we see that reference libraries, bookstores, and other services provided by traditional universities can be offered via a computer conferencing system.

The Electronic University Network (EUN)

The EUN is a commercial enterprise that provides a framework of communication services and administrative support for organizations that wish to provide distance education courses online. Courses and programs from several traditional colleges and universities are offered through the EUN. The company also promotes flexible transfer of credits among colleges. Since 1984 the San Francisco-based company has enrolled nearly 10,000 students representing all the states and several foreign countries.

The EUN 1991 Catalog describes courses leading to the following degrees and certificates: Master of Business Administration from Saginaw Valley State University; Bachelor of Science in Business Administration from Thomas A. Edison State College; Bachelor of Science in General Business from Regents College of the University of the State of New York; Bachelor of Arts from Thomas A. Edison State College; Associate in Arts from Thomas A. Edison State College; Associate in Science in Management from Thomas A. Edison State College; and several Certificates in Business from Thomas A. Edison State College.

Seventy-eight individual courses are offered by the following colleges and universities: Thomas A. Edison State College, Ohio University, Oklahoma State University, Washington State University, University of Illinois, University of Maryland University College, and State University of New York at Buffalo. These colleges and universities are responsible for developing and teaching their courses through the EUN and for student evaluation and certification.

According to the EUN catalog, "All of these state institutions have regional accreditation. All accept transfer credit from other accredited institutions. Edison and Regents also award credit for experience and for job-related training; you can combine the EUN courses with courses you've taken elsewhere, plus credit for nonformal learning and training." (The Electronic University Network 1991, 10)

The EUN does not provide computer conferencing for group communication; however, e-mail is provided for one-to-one communication between students and tutors. For each course, the students receive "Protege," a software package comprising communication software, a text editor, and a course-specific module. Tutors use the "Mentor" software-package.

The EUN Legacy to Electronic Universities. The EUN provides access to courses from several universities and colleges through one single system. It also promotes transfer of credit among colleges and universities. These are two important services in an electronic university. On the other hand, the EUN lacks group communication facilities that are critical in a university environment. Without these, the EUN may be regarded as a distance education organization that has upgraded traditional correspondence courses to more timely e-mail courses.

DT200 - An Introduction to Information Technology

In 1988, the British Open University enrolled 1,364 distance students in a course partially taught via a computer conferencing system (Mason 1989). Each of the sixty-five part-time tutors moderated a conference of up to twenty-five students. The communication element was just a small fraction of the coursework and about 350 students dropped out. Still, we must conclude that the Open University managed to handle a large-scale computer conferencing course.

The DT200 Legacy to the Electronic Universities. This course proved that it is possible to handle a large-scale course in a single computer conferencing system when the students are clustered in small groups, each moderated by a tutor.

The Spanish UNED

The Spanish National University for Distance Education—Universidad Nacional de Educacion a Distancia, UNED—was founded to reach the goals stated in a 1972 governmental act:

> The necessity to develop one of the basic aims of the educational reform, that is to say, equal opportunities for all, requires the implementation of those means that facilitate access to higher education to those who, for reasons such as home residence, work activities, etc., cannot attend programmes offered by conventional universities. (cited in Garrido 1991, 3)

UNED has approximately 120,000 students studying in a great number of programs; 800 full-time employees make up the headquarters' teaching staff. In addition, 2,500 part-time tutors are engaged at the fifty-three Regional Centers in Spain and Latin America. These Regional Centers "offer information and counselling for people who have not yet enrolled as students, and once a student is enrolled, he or she uses the buildings and facilities provided by the center in order to meet tutors and other students in formal or informal work groups" (Garrido 1991, 4).

UNED uses several different communication media. The most important of these is printed material. Other media include radio programs broadcast through Radio Nacional de España from 8 to 11 p.m. every evening and audio- and videocassettes.

The UNED Legacy to Electronic Universities. UNED has valuable experience and knowledge about distance students' problems and needs. The university has established course development standards and administrative systems developed to support distance students. Furthermore, it has a network of regional study centers, and it utilizes a variety of distance education media. An electronic university could develop a similar, large-scale infrastructure to handle essential distance education needs.

Pennsylvania State University (PSU)

PSU is a traditional university serving 36,000 students with 12,000 employees at the main campus. The university is divided into colleges and departments, each responsible for its own programs and courses. This structure is supported by libraries, computer centers, administrative sections, etc. Students, faculty, and staff carry out the university chores. Graduate assistants and teaching assistants help professors in the teaching and research processes. Students may also be employed to assist the staff with administrative and executive chores.

The PSU Legacy to Electronic Universities PSU is a large organization, divided into many smaller entities which deal with educational and administrative responsibilities. An electronic university, based on computer conferencing, can technically handle these entities in separate conferences, in the same way that substantial numbers of students are grouped in hundreds of classes taught by professors and teaching assistants. An electronic university also may cluster students into groups of manageable sizes, and large classes may be split into subgroups taught by teaching assistants supervised by a professor. In addition, an electronic university can provide support services, such as libraries, bookstores, etc., adjunct to course services.

National Open Electronic Universities: A Vision

The following is a possible scenario for National Open Electronic Universities: open admission universities collaborating with every college that wishes to offer distance education, universities based on communication technology and national transfer of credits. In this scenario, the National Open Electronic Universities are named NETS. NETS offer a wide range of distance education programs, all independent of time and space. Students and faculty participate in vivid cross-curricular and social university environments. Thousands of students access the NETS from home or work. The faculty are employed by local colleges across the nation.

NETS are *national* universities. They coordinate and increase the efficiency of the national distance education ventures. They offer national benefits for students, faculties, colleges, and nations. Students do not need to interact with several colleges and technical systems. Faculty members have access to a national network of educators, and the colleges may offer their programs nationwide, without prohibitive investments in technical equipment.

NETS are *open* universities. They are open to everyone who wishes to study, independent of place of residence, work schedule, and previous educational background. Furthermore, NETS collaborate with all college and university distance education units to deliver courses and programs. Students may customize their education, choosing courses from different institutions. Credits are, of course, transferable among these institutions.

NETS are *electronic* universities. They utilize modern technology to create higher education

environments independent of time and space. National computer conferencing systems facilitate written communication. National educational television and radio networks, as well as audio and video conferences, are available for the NETS.

NETS are not science fiction; they could be realized today. The most likely development, however, is a careful evolution from existing educational organizations toward electronic universities. This transformation could happen within open universities such as the British Open University (Mason 1989), the Dutch Open University (Meurs and Bouhuijs 1989; Enckevort and Leibbrandt 1988), the Indira Gandhi National Open University in India (J. K. Miller 1988), or The National University for Distance Education in Spain (Garrido 1991). Further, traditional universities, using computer conferencing for on-campus purposes, may merge or collaborate with distance education organizations to form electronic universities.

International Electronic Universities: Incentives and Barriers

Electronic universities will provide education internationally, global communications networks will eradicate national boundaries, and international communication costs will steadily decrease. Furthermore, investments in large computer systems will urge electronic universities to expand their traditional markets to attract more customers. Several projects—The University of the World (UW 1990), The International University Consortium (G. Miller 1988), The Global Electronic University (Utsumi 1990), and EuroPace (Morgen 1990)—have already followed this path.

We should welcome the process of development toward international electronic universities because these institutions will provide more options with better educational quality than is currently available. They will contribute to more knowledge and better understanding of different cultures and nations. Yet international educational services may create some unpleasant competition for traditional universities and distance education organizations. Most of these institutions are not prepared to meet such competition.

Internationalization will be slowed down by national and state regulations. Within the U.S.A. it is often hard to transfer credits and certificates from one state to another. In Europe this may be even harder because the national education systems are not well coordinated. However, the European Community is working toward coordination and free flow of students among member countries. At the same time, technological development propels interstate and international educational collaboration. It is very likely that international education will be dominated by English-speaking universities, most of them based in the United States. It is also obvious that these universities will have a large international impact on students and the community they will form. Understandably, smaller nations, speaking other languages, are worried about emerging educational/cultural imperialism. They are afraid of losing some of their national culture, language, history, and tradition in the process. Smaller nations can prepare for this international competition by establishing National Open Electronic Universities.

Internet: The Ultimate International Electronic University?

Internet offers five categories of services: e-mail, computer conferencing, remote log-in, file transfer, and synchronous communication. The e-mail service is by far the most comprehensive in the world. Millions of people can exchange messages through the worldwide net. In addition to private messages, about 2,000 distribution lists disseminate information dealing with a diverse array of topics. The distribution lists are controlled by Listserv, a distributed application that comprises many of the features available from other computer conferencing systems.

Internet computer conferencing, known as News, Usenet, or Netnews, is a distributed system with which a local host can establish local conferences and join global conferences. A computer can host hundreds of conferences. Conferences can exchange notes via Listserv.

Remote log-in allows users on one node to log in to another computer in Internet. This feature provides access to many valuable services around the world, including computer conferencing systems, databases, libraries, on-line books, and software applications. File transfer, called FTP, permits anonymous users to download files from another node. This is a convenient way to distribute data and software files. Synchronous communication, called Relay Chat, Tell, etc., allows users throughout the net to communicate synchronously in real time.

Internet's main objective is to link educators and researchers. The following examples of services and their educational implementations should be of special interest to distance educators:

- The eight Distance Education Centres in Australia use Internet in distance education (Castro 1990);
- ComServe offers conferences, seminars, and workshops via Internet (Note 1);
- The ICDL Database for distance education at the British Open University is available via Internet (Paulsen 1991);
- Students and faculty at Ohio State University have access to at least nine major libraries and a number of databases via Internet (Dixon 1991); and
- The electronic journals *DEOSNEWS* and the *Distance Education Online Journal* are distributed via Internet (Notes 2 and 3).

Commercial messages are not allowed on Internet. Commercial messages are, however, hard to define and in practice impossible to monitor. As a result, there are many announcements of books, software products, and conferences. Commercial services such as CompuServe and MCI Mail offer e-mail exchange with Internet, so these services in fact charge their users for Internet services. Furthermore, many universities and colleges use Internet in their courses and charge students for tuition and computer fees. The eight Distance Education Centres in Australia, for example, offer distance education services through AARN–the Australian branch of Internet (Castro 1990).

An intriguing business idea (inspired by the Connected Education concept) is the provision of commercial distance education on Internet. This service would provide access to a vast number of

prospective students, teachers, and educational services from all around the world. Such a service would probably trigger some serious discussions about commercial use of Internet. However, Internet has the potential to become the ultimate international electronic university, and one incentive to such a development is to allow commercial courses to be delivered via Internet.

Electronic University Challenges

Establishing an electronic university is, of course, a huge, multifaceted challenge. Many economic, pedagogical, administrative, and organizational challenges will need to be faced.

Economic Challenges. Tony Bates states that "[t]hird generation technologies [computer conferencing] are particularly valuable where relatively small numbers of students are concerned, since they avoid the high fixed production costs of the industrial model, but they do not however bring the economies of scale of the industrial model, unless the opportunities for interaction for an individual student are dramatically curtailed" (Bates 1990, 7). Bates's observation is important and correct for current use of computer conferencing. Our challenge is therefore to develop electronic universities so large that the industrial model (Peters 1983) can be applied, while still clustering the users in smaller groups to facilitate individual communication.

Pedagogical Challenges. We need to learn more about how to handle large numbers of students and faculty. In such an environment, it is especially important to apportion responsibilities and disperse information in an efficient way. Several professors and teaching assistants can be involved in the teaching of a single course. The challenge is to develop methods for co-teaching large-scale courses.

Administrative Challenges. There are still several applications that are not handled in today's conferencing systems. Management information systems generally depend on applications developed for other purposes. It is a future challenge to integrate these applications with the computer conferencing system. The applications most obviously needed are accounting, grading, and logistic systems.

Organizational Challenges. There are many questions that must be addressed if several organizations are to collaborate to form an electronic university. Although agreements will depend on the organizations involved, some important questions will be common to all such situations:

- How can geographically separated colleges cooperate in an electronic college?
- Who should own and run the host computer?
- Who should be responsible for user support?
- What should the colleges pay for the electronic university services?
- What about transfer of credits?
- How can the colleges share resources like libraries, databases, etc.?
- How much should we separate or integrate users in programs from different colleges?

Conclusion

The examples in this article show that most of the important components of a large-scale electronic university are developed by existing organizations. None have integrated the components into a single system yet, but there is an abundance of examples showing that the integration process has been evolving. Traditional universities have started to use technology such as audio, video, and computer conferencing to reach out to a larger audience. Open universities integrate computer conferencing into their courses. Several courses are taught through commercial computer conferencing systems such as CompuServe. And, even more interesting, the new technology has already created many new, untraditional alliances. Private correspondence schools collaborate with state universities, and educational organizations, tied together by computer networks and communication satellites, establish relations across national boundaries. It is most likely that both the technical development and the forming of new, strong alliances will continue and, eventually, lead to the formation of full-fledged electronic universities.

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Notes

1. Information about ComServe is available from SUPPORT@RPIECS.BITNET

2. DEOSNEWS is a distribution list that can be accessed from LISTSERV@PSUVM.PSU.EDU

3. DISTED is a distribution list that can be accessed from LISTSERV@UWAVM.BITNET

The Hexagon Of Cooperative Freedom: A Distance Education Theory Attuned to Computer Conferencing

Introduction

This article presents a distance education theory based on existing theoretical perspectives and discusses how it applies to computer conferencing. In an analysis of existing theories of distance education, Keegan (1988a, 30) concluded that six major elements define a distance education program:

- The separation of teacher and learner, which distinguishes it from face-to-face learning;
- The influence of an educational organization, which distinguishes it from private study;
- The use of technical media, usually print, to unite teacher and learner and carry the educational content;
- The provision of two-way communication so that the student may benefit from or even initiate dialogue;
- The possibility of occasional meetings for both didactic and socialization purposes; and
- The participation in an industrialized form of education which, if accepted, contains the genus of radical separation of distance education from other forms.

The implications of introducing CMC in distance education are discussed for each of these elements by Mason and Kaye (1990). They conclude that the use of CMC has three major implications for distance education:

- The breaking down of conceptual distinctions between distance education and place-based education;
- The changing of traditional roles of faculty, administrative and support staff, and adjunct tutors; and
- The provision of an opportunity, which never existed before, to create a network of scholars, "space" for collective thinking, and access to peers for socializing and serendipitous exchange.

These implications are so important that it is necessary to re-evaluate traditional distance education theories and discuss how they attune to CMC.

Distance Education Theories

Many theoretical perspectives on distance education have been presented during the last twenty years. Keegan (1988b) identifies these three theoretical positions:

- Theories of autonomy and independence,

- Theories of industrialization, and
- Theories of interaction and communication.

One representative theory in each position follows and the implication of the theory for computer conferencing is discussed.

Theories of autonomy and independence. Moore's inductive analysis of descriptions of two thousand instructional programs led to the development of a theory on dialogue, structure, and autonomy (Moore 1991). Moore perceives dialogue as interaction between learner and instructor, structure as certain characteristics of course design, and autonomy as learner independence. He argues that distance education organizations should ideally give students maximum independence with regard to choice of aims, objectives, study methods, and learning activities; study pace and progression; and evaluation (Moore 1983).

In a recent paper , Moore (1991) encourages analysis of the effects computer conferencing has on dialogue, structure, and autonomy. First, the introduction of group communication means that dialogue is no longer mere communication between learner and instructor. Second, few courses have been designed for computer conferencing; the majority have adapted their structure from existing distance education courses or face-to-face courses. Third, computer conferencing is devised for group activity, so too much autonomy is not within its scope. However, the goal must be to devise systems that support individual freedom as well as cooperative group activity.

Theories of industrialization. Peters's (1988) applications of industrial theory led him to conclude that the structure of distance teaching is determined to a considerable degree by the principles of industrialization, particularly by those of rationalization, division of labor, and mass production; the teaching process is gradually restructured through increasing mechanization and mass production. These changes account for the emergence of the following structural propositions:

- The development of distance study courses is just as important as the preparatory work taking place prior to the production process.
- The effectiveness of the teaching process is particularly dependent on planning and organization.
- Courses must be formalized and expectations from students standardized.
- The teaching process is largely objectified.
- The functions of academics teaching at a distance have changed considerably vis-à-vis university teachers in conventional teaching.
- Distance study can only be economical with a concentration of the available resources and a centralized administration. (Peters 1988, 110)

At first sight, the theory of industrialization does not seem to apply to computer conferencing. Bates (1991) states:

> Third generation technologies [computer conferencing] are particularly valuable where relatively small numbers of students are concerned, since they avoid the high fixed production costs of the industrial model, but they do not

> however bring the economies of scale of the industrial model, unless the opportunities for interaction for an individual student are dramatically curtailed. (p. 13)

So far, we have very limited knowledge about how computer conferencing can be applied to mass education. We know, however, that computer conferencing systems can handle thousands of users. Hence, in a discussion of future electronic universities, this author describes how computer conferencing systems can be designed to support mass education (See "The Electronic University: Computer Conferencing in Mass Education," p. 46).

Theories of interaction and communication. In his theory of guided didactic conversation, Holmberg (1988) views the distance-study course and its non-contiguous communication style as instruments of a "conversation-like interaction between the student on the one hand and the tutor counsellor of the supporting organization administering the study on the other" (p. 115). Constant interaction (conversation) between the supporting organization (authors, tutors, counselors) is both simulated and real: simulated through the students' interaction with the pre-produced course materials and real through written and/or telephone interaction with their tutors and counselors.

Holmberg's theory is developed with a focus on correspondence courses and one-to-one communication. Consequently, it does not give much consideration to group communication. However, the theory can be developed further to include group facilitation, and a number of authors have recommended related facilitation techniques for computer conference courses.

To date, very little pre-produced course material is developed just for computer conferencing. Most of the material is adapted directly from existing face-to-face or correspondence courses. More work must be done in the future to produce tailor-made material for computer conferencing courses. An important feature of such material would be the potential for asynchronous group interaction. On the other hand, experience has shown that computer conferencing as currently implemented can be an excellent medium for facilitating a guided didactic conversation between the students, the tutors, and the supporting organization.

The Theory of Cooperative Freedom

The theory of cooperative freedom can be classified as a theory of autonomy and independence, as described earlier in this article. It is influenced by Knowles's (1970) theory of andragogy, which asserts that adult learners perceive themselves as self-directing human beings and define themselves in terms of their personal achievements and experiences. The theory of cooperative freedom perceives both adult and juvenile distance learners as motivated, self-directing students with a desire to control their learning outcomes. Further, the theory applies to all three categories of Houle's (1961) student motivational orientations: goal oriented, activity oriented, and learning oriented.

McCreary (1990, 120) indicates how each of Houle's categories will relate to computer conferencing systems. Goal-oriented participants will perceive CMC as a way to "keep the edge" and to use state-of-the-art technology to achieve their goals. Activity-oriented students cannot resist the always-available online

activity. Finally, knowlege-oriented people may be motivated by access to all the up-to-date information and knowledgeable people that CMC provides.

The theory of cooperative freedom suggests that, independent of motivational orientation, distance students need cooperation as well as freedom.

Cooperation. Houle (1984) states that education is a cooperative rather than an operative art: it implies voluntary interaction among individuals during learning. Even solitary students guiding their own programs without the help of an instructor seek help and encouragement from others. In a social setting, those who take part in an educational activity should have some sense of collaboration in both planning and implementation:

> At one extreme, this sharing is so complete that it requires a group to decide everything that it does together. At the other extreme, the sharing may be implicit in the teaching-learning situation, as when many people flock to hear a lecturer. Those who attend vote with their feet, as the saying goes, and one cannot assume from their physical passivity and silence as they sit in the auditorium that they are not cooperating fully in their instruction. (Houle 1984, 45)

Cooperation can be hard to achieve in distance education. A major problem for many students is the loneliness that results from limited access to student peers; the urge for individual freedom may intensify the problem. However, new group communication technologies such as audio conferencing, video conferencing, and computer conferencing have been devised to facilitate cooperation at a distance.

Freedom. The theory of cooperative freedom is concerned with freedom from restraints rather than freedom from oppression. It professes that students should have a high level of freedom to choose rather than be restrained by a rigid distance education program. It states that freedom is crucial in distance education. For many people, the need for continuing education and lifelong learning is increasing. Today's students, however, often have full-time jobs and families to take care of and many are reluctant to participate if it means relinquishing high-quality family life and job achievements. They need flexible education: education that allows them to combine job, family, and education in a manageable way.

Freedom is a complex construct. It has many facets and features. The theory of cooperative freedom suggests that the facets of special importance to distance education are time, space, pace, medium, access, and curriculum. None of these can be described as dichotomous; each must be perceived as a continuum. This article describes important features of these six facets of freedom that program planners should consider when they develop distance education programs based on computer conferencing. The facets are presented and discussed as the Hexagon of Cooperative Freedom (Figure 1).

Cooperative freedom is a fabricated term. At first sight, it seems self-contradictory. "Cooperative" indicates group interaction, though "freedom" implies individual autonomy. Yet, if we could develop a distance education system that combines freedom for the individual with group cooperation, we would attain a distance education system based on cooperative freedom. This article argues that such a system can be made possible by computer conferencing and discusses its potential strengths and weaknesses.

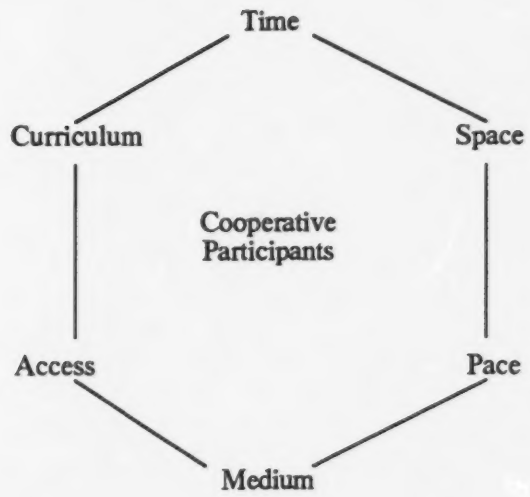

Figure 1. The Hexagon of Cooperative Freedom

Freedom of time. In distance education, one must distinguish between synchronous and asynchronous communication. In asynchronous communication, the message is stored in the communication medium until the receivers find it convenient to retrieve it. Synchronous communication, on the other hand, is inflexible, but allows people to communicate in real time, as they do face to face or on the telephone. Scheduling of synchronous communication varies in flexibility. A telephone conversation can be initiated without any prior schedule, but a videoconference must usually be scheduled months in advance.

A high level of freedom allows students to communicate whenever it is convenient for them. Students may prefer to study during the weekends, after their children have gone to bed, during regular work hours, or whenever they have time available. In addition, response time to a message should be minimal.

Computer conferencing is completely independent of time. Ideally it is available 24 hours a day, 365 days a year. It gives instantaneous access to information whenever it is convenient for the user and there is no need to synchronize the operation among communication partners. Many systems provide synchronous communication, as well.

Freedom of space. The first of Keegan's major elements for defining distance education dealt with the separation of teacher and learner. This separation does not necessarily imply much freedom of space. Many distance education programs, for instance those taught by videoconferencing, require students to attend classes at fixed locations. Further, Keegan concludes that distance education may include occasional face-to-face meetings.

Distance education programs with a high level of freedom let students choose where they want to study. Some may want to meet in a classroom with their peers while others prefer to study at home, at

work, or wherever a busy life situates them.

Computer conferencing can be accessed worldwide, wherever there is a telephone. Long distance telephone charges, though a limiting factor, can to some extent be reduced by access to data networks.

Freedom of pace. Pacing implies meeting deadlines for starting a course, for examinations, and for assignments. Deadlines, however, can be flexible or rigid. They are flexible when students can set the deadlines, or select one of several deadlines. One example of extreme pacing flexibility is seen in correspondence courses that allow students to start and finish at any time. A more moderately flexible example is a course with multiple starting dates that allow students to enroll at a convenient time. Shale (1987, 32) asserts that "...standardized treatments [of pacing] could be applied to all students on an individual basis." He also suggests possible justifications for rigid pacing:

- To make the administration of a distance-learning system tractable,
- To express a commitment to a collectivist philosophy,
- To guarantee the credibility of examinations,
- To enhance student motivation through group activity, and
- To avoid procrastination. (Shale 1987)

Based on a study of students who took the same course either by correspondence or by computer conferencing, Rekkedal concludes that "the correspondence students consider individual pace of study to constitute a large advantage of correspondence studies, while the EKKO [computer conferencing] students give more varied viewpoints" (Rekkedal 1990, 91).

A high level of freedom allows students to choose the pacing they prefer. If they resent rigid pacing, they should be allowed to spend the time they require to complete a course. Other people would like to choose when to start a course and how fast to progress in it.

Wells (1992) identifies three pacing techniques available with CMC. The first is group assignments that urge coherent pacing within groups. The second is gating, a technique that denies students access to information before they have completed all prerequisite assignments. The third technique is limited time access to services such as conferences, databases, and guest speakers.

The previous discussion shows that computer conferencing courses can be paced to a greater or lesser extent. Meaningful group communications, perhaps computer conferencing's major advantage, may, however, be hard to accomplish in an unpaced mode.

Freedom of medium. Nipper (1989) argues that there are three generations of distance education. The first generation uses correspondence teaching based on printed and written material. The second is based on broadcast media, such as television and radio, as well as on distribution of video- and audiocassettes. The third generation uses computer conferencing systems. Each generation utilizes the media devised in earlier generations.

Programs with a high level of freedom provide students with access to several media or sources of

information: print, video, face-to-face meetings, computer conferencing, etc. This approach will support different learning styles and prevent exclusion of students lacking access to or knowledge of high-technology media. Computer conferencing can easily and favorably be supplemented by or integrated with textbooks, audio and videoconferences, computer-aided instruction, etc.

Freedom of access. This point is related to the terms "open learning" and "open education." Charles A. Wedemeyer explains the origin of the term open learning:

> This term came into use in 1969 when the British Open University was founded. It...means providing part-time learning opportunities for learners at a distance, who operate with a degree of autonomy and self-direction, but with open mediated access to learning without conventional prerequisites for acceptance or accreditation. (Wedemeyer 1981, xxvi)

Escotet (cited in Keegan 1986) characterizes open education as less restricted, exclusive, and privileged than traditional education; as flexibly paced; as encouraging new relationships between professors and students; and as willing to accredit the value of students' life experiences.

Programs that aspire to a high level of freedom must eliminate discrimination on the basis of social class, entry qualifications, gender, age, ethnicity, or occupation. Programs should not ask students to document prior education; rather, students should decide for themselves whether they are capable of pursuing the course of study. Access should be available to students with limited monetary resources, and to those with no access to or limited knowledge of distance education technology. A major concern for computer conferencing is its image as an exclusive medium closed to prospective students lacking access to necessary equipment or knowledge about how to use it. Fortunately, this problem is alleviated year by year as more people learn to use computers at home, school, or work.

Freedom of curriculum. This facet reflects the theories of autonomy and independence discussed earlier in this article. One noticeable example of such freedom is provided by the Electronic University Network, which promotes transfer of credits among all its member colleges.

A high level of freedom allows students to choose among a range of courses and to transfer credits between programs and universities. It further implies opportunities for individual studies, learning contracts, internships, etc.

Computer conferencing has the potential to enhance inter-college collaboration. Several programs, perhaps from different colleges, could favorably be offered through one computer conferencing system. It is to be hoped that such multi-program computer conferencing systems will provide additional course options and transfer of credits.

Discussion

Freedom is a multi-dimensional construct. Each dimension should be regarded as continuous rather than dichotomous, as relative, not absolute. All distance education programs will have some freedom in

each dimension. There are no quick, definite, or ready-made answers to the question of how much freedom a distance education program should provide. Nevertheless, program planners who address this question are likely to provide better distance education.

A high level of student freedom, assumed in this article to be a desirable goal of course design, is extremely difficult to achieve. Scarce resources and rigid educational regulations often inhibit flexible distance education. Yet, the hexagon of cooperative freedom can serve as a guide for implementation of distance education.

One may say that one person's freedom ends where another's begins, that one person's freedom to act infringes on the freedom of another. As Burge (1991) points out in relation to computer conferencing, "One person's time flexibility is another's time delay." The truth of this statement is hard to refute, but such negative consequences could be mitigated by reducing dependence on individual students and instructors. Coteaching, for instance, could reduce the response time since several teachers can access the system more often than one teacher can.

Individual freedom is hard to combine with an industrialized model of education and can hardly compete in terms of cost effectiveness with industrialized mass education. There is a trend, however, toward customized mass production. A buyer of a new car today may choose among several accessory options. Why, then, should not modern mass education aim for individual flexibility?

Conclusion

Future adult students will seek individual flexibility and freedom. At the same time, they need group collaboration and social unity. Computer conferencing, when integrated with other media, can be the means of joining freedom and unity into truly flexible, cooperative distance education programs.

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AFTERWORD

It is neither surprising nor remarkable that the section of this report on the possibilities of National Open Electronic Universities so closely echoes the ideas and approaches outlined in a paper Tony Kaye and I wrote several years ago. This now appears in *Online Education*, edited by Linda Harasim, but was not available to Morten Paulsen until after he wrote the initial draft of the present article. In fact, the ideas are a natural extension of the success of distance education and the technological developments of computer networking. The wider movements around the notion of a global village and mutual interdependence also contribute to the growing international trend in education.

What is interesting, I think, is the extent to which many of the foundation stones for the growth of such electronic universities have fallen into place since we indulged in what appeared to be rather speculative writing in 1988–1989. Paulsen refers to several of these: new collaborations between teaching institutions, innovative integrations of conferencing with other high-technology media, and teaching and training courses appearing on commercial conferencing systems. Furthermore, throughout the report—from the theoretical framework to the details of case studies and the extensive bibliography—he indicates the way in which online education is developing and finding new applications.

Collaboration among universities to write joint courses, to share course material or even students, or to acknowledge credit from other institutions, has a long and not-very-distinguished history. There are many reasons, both justifiable and unjustifiable, for the difficulties and failures in inter-institutional collaboration. However, there are some signs that computer conferencing will provide a new form of linking—student-driven, rather than faculty-led—which could break down some of the barriers to collaborative teaching. With the advent of distributed conferencing, students can access conversations at other participating institutions delivering similar courses. Students could thus gain some of the advantages of international contacts, wider perspectives on course issues, and expert tutoring and discussion, without the need for major formal collaboration agreements among institutions. This very welcome new direction, hastened by the developing technology, will facilitate the realization of the electronic university vision.

Another such step is being taken on both sides of the Atlantic in setting up the technological infrastructure to support extensive networking among institutions. The Economic Community, through its DELTA, RACE and COMETT programs, is funding a variety of research and development programs to establish the protocols, cost structure, and feasibility of electronic networking throughout Europe. Similar initiatives are currently being promoted at the K–12 level throughout the United States.

As Paulsen says, electronic universities are already possible and indeed embryonic versions of them are in operation. It is time, therefore, to turn our attention to the important questions about what they should be like. Paulsen highlights a number of the issues, both organizational and pedagogical. Our original concern was that these new institutions should combine the power, prestige, and advantages of large-scale systems with the benefits of human-scale, student-centered interactions. It is the potential of computer conferencing to facilitate this development which needs to be exploited.

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